IPT COMMENT 11 5 REVISED IPT TABLES

Table 2-9

Condensate Collection and Treatment IPT Results

Date	Total MeOH Collected 15- day average (lb/ODTP)	Required MeOH Collected (lb/ODTP)	Effective Steam to Feed Ratio (ESFR)	Steam Stripper MeOH Removal Efficiency (%)	HAP Treated in Steam Stripper (Ib/ODTP)	F _{bio}	Number of Aerators	HAP Treated in ASB (lb/ODTP)	Total HAP Treated (lb/ODTP)	Required HAP Treated (lb/ODTP)
7/9/2021	10.9	7.2	18.3	78%	6.5	86.5	37	3.3	9.9	6.6
7/10/2021	11.2	7.2	18.2	77%	6.4	90.1	37	3.7	10.1	6.6
7/11/2021	11.3	7.2	17.9	76%	6.6	90.9	37	3.8	10.5	6.6
Average			18.1	77%		89.17				

Table 2-10

Aeration Stabilization Basin Data New-Indy Catawba - Catawba, SC

Date	ASB Effluent BOD ₅ Data (ppm)	ASB Zone 1 MLVSS (ppm)	ASB Zone 2 MLVSS (ppm)	ASB Zone 3 MLVSS (ppm)	Aerator Horsepower (hp)	ASB Inlet Liquid Flow (MGD)
7/9/2021	15	243	191	154	2,775	21.66
7/10/2021	16	350	250	98	2,775	21.58
7/11/2021	24	397	273	147	2,775	20.82

Notes:

MLVSS: Mixed Liquor Volatile Suspended Solids BOD₅: Total Biochemical Oxygen Demand, 5-day

Attachment IPT11 **Table 3-1**

Laboratory Sulfides Data - Method RSK-175

Dete	Q	RSK H2S,	RSK DMDS,	RSK DMS,	RSK MMC,
Date	Sample	ppb	ppb	ppb	ppb
	Foul Condensate - Average	114,205	7,954	5,619	6,731
	Stripped Condensate - Average	32,226	2,537	1,195	572
	ASB Influent (Wastewater) - Average	25.4	14.0	27.7	0.23
7/9/2021	ASB Zone 1 Center - Average	22,458	4.4	52.6	188
	ASB Zone 2 Center - Average	2,500	1.6	6.5	32.8
7/9/2021	ASB Zone 3 Center - Average	74.1	1.0	1.5	3.0
	ASB Effluent - Average	3.3	1.2	7.9	0.73
	Post-Aeration Basin Inlet	2.5	7.4	2.8	1.3
	Post-Aeration Basin Surface	62.9	59.3	21.4	9.0
	Post-Aeration Basin Outlet	212	21.1	9.4	3.8
	Foul Condensate - Average	96,940	9,978	6,343	4,827
	Stripped Condensate - Average	2,292	2,957	939	59.9
	ASB Influent (Wastewater) - Average	12.5	29.3	64.5	0.38
	ASB Zone 1 Center - Average	11,471	131	137	155
7/10/2021	ASB Zone 2 Center - Average	1,757	19.8	14.0	40.4
7/10/2021	ASB Zone 3 Center - Average	2.1	1.0	0.38	0.19
	ASB Effluent - Average	2.9	1.3	3.9	0.95
	Post-Aeration Basin Inlet	0.83	1.0	1.3	0.11
	Post-Aeration Basin Surface	0.63	1.0	0.34	0.11
	Post-Aeration Basin Outlet	1.1	1.0	1.2	0.11
	Foul Condensate - Average	46,857	4,827	2,729	1,052
	Stripped Condensate - Average	6,031	864	381	34.8
	ASB Influent (Wastewater) - Average	14.0	14.7	60.2	0.54
	ASB Zone 1 Center - Average	10,837	858	346	49.8
7/11/2021	ASB Zone 2 Center - Average	466	4.2	2.0	27.7
7/11/2021	ASB Zone 3 Center - Average	6.7	34.3	7.8	1.1
	ASB Effluent - Average	18.2	3.3	3.0	1.3
	Post-Aeration Basin Inlet	1.8	3.6	0.68	0.11
	Post-Aeration Basin Surface	0.25	1.0	0.34	0.11
	Post-Aeration Basin Outlet	0.04	1.0	0.43	0.11

Attachment IPT11 Table 3-3

F_{air} and F_{bio}

Date	Source	ASB F _{air} (a)	Post-Aeration Tank F _{air} ^(a)	ASB F _{bio} ^(a)	Post-Aeration Tank F _{bio} ^(a)
7/9/2021	Hydrogen Sulfide	4%	125%	96%	-25%
7/10/2021	Hydrogen Sulfide	10%	171%	90%	-71%
7/11/2021	Hydrogen Sulfide	19%	27%	81%	73%
	Hydrogen Sulfide	11%	108%	89%	-8%
Average During IPT	Methyl Mercaptan	91%	77%	9%	5%
(7/9-11/2021) ^(b)	Dimethyl Sulfide	83%	63%	17%	11%
	Dimethyl Disulfide	41%	31%	59%	47%

^(a) For hydrogen sulfide, F_{bio} is the percent of inlet sulfide concentration removed. F_{air} is equal to $(1-F_{bio})$ ^(b) F_{air} and F_{bio} for methyl mercaptan, dimethyl sulfide, and dimethyl disulfide were calculated using WATER9 using the average data during the IPT. Hydrogen sulfide results are from H2SSIM for each day of the IPT.

Table E-1

Comparison of Original and Duplicate Data - Methanol and HAP^(a)

			Acetaldehyde			2-Butanone (MEK)			Propionaldehyde			Methanol		
Sample Location	Date	Time	Original Result (ppm)	Duplicate Result (ppm)	Percent Difference									
Foul Condensate Composite	6/30/2021	8:00 AM	19	20	5%	10	10	0%	1.0	1.0	0%	2,000	2,100	5%
Foul Condensate Sample 3	7/9/2021	5:00 PM	24	24	0%	7.6	7.5	-1%	1.0	1.0	0%	2,500	2,400	-4%
Stripped Condensate Sample 3	7/9/2021	5:05 PM	3.8	3.6	-5%	1.7	1.5	-12%	1.0	1.0	0%	440	430	-2%
ASB Influent Sample 3	7/9/2021	5:40 PM	1.0	1.0	0%	1.0	1.0	0%	1.0	1.0	0%	82	78	-5%
ASB Effluent Sample 3	7/9/2021	5:45 PM	1.0	1.0	0%	1.0	1.0	0%	1.0	1.0	0%	0.5	0.5	0%
ASB Zone 1 Sample 1	7/10/2021	9:39 AM	1.0	1.0	0%	1.0	1.0	0%	1.0	1.0	0%	59	57	-3%
ASB Zone 2 Sample 1	7/10/2021	8:31 AM	1.0	1.0	0%	1.0	1.0	0%	1.0	1.0	0%	8.4	10	19%
ASB Zone 3 Sample 1	7/10/2021	8:14 AM	1.0	1.0	0%	1.0	1.0	0%	1.0	1.0	0%	0.5	0.86	72%

⁽a) Results in *italic* font were below the method reporting limit (MRL). The results have been reported at the MRL.

Table G-3

Detailed R Factor Calculations

Date	Acetaldehyde (ppm)	MEK (ppm)	Propionaldehyde (ppm)	Concentration of non-MeOH HAP (ppm)	Pulp Production (ODTP)	Total Foul Condensate Flow (MGD)	F(nonmethanol) (lb/ODTP)	R-Factor
7/9/2021	24.33	7.65	1.07	33.05	1,694	1.04	0.17	0.014
7/10/2021	25.33	5.73	4.00	35.07	1,609	1.06	0.19	0.015
7/11/2021	25.00	6.50	7.00	38.50	1,356	1.04	0.25	0.019
Average:		1				-1	-1	0.016

Table G-4

Detailed Condensate Treatment Calculations - ASB

Date ^(a)	Foul Condensate Methanol (ppm)	Foul Condensate Flow to ASB (MGD)	MeOH to ASB (lbs/day)	MeOH to ASB, 15- day Total (lbs/day)	Pulp Production (ODTP)	MeOH to ASB, 15- day Total (lbs/ODTP)	Number of Aerators	F _{bio}	R-Factor	MeOH Treated in ASB (lbs/ODTP)
6/23/2021	1,700	0.16	2,267		1,539					
6/24/2021	2,400	0.29	5,723		2,102					
6/25/2021	2,600	0.28	6,069		2,040		-			
6/26/2021	2,400	0.32	6,377		1,884		-			
6/27/2021	2,500	0.21	4,457		1,808					
6/28/2021	2,500	0.11	2,340		1,697					
6/29/2021	2,400	0.36	7,115		1,804			-		
6/30/2021	2,050	0.47	8,042		1,874					
7/1/2021	1,900	0.40	6,356		1,360					
7/2/2021	1,600	0.37	4,883		1,166					
7/3/2021	2,000	0.40	6,653		1,749					
7/4/2021	2,200	0.53	9,702		1,663					
7/6/2021	1,600	0.81	10,784		1,806					
7/7/2021	2,200	0.41	7,530		1,947			-		-
7/8/2021	2,300	0.39	7,537		1,449					
7/9/2021	2,383	0.33	6,506	100,074	1,694	3.8	37	86.5	0.014	3.3
7/10/2021	2,267	0.35	6,710	101,061	1,609	4.0	37	90.1	0.015	3.7
7/11/2021	2,000	0.33	5,573	100,566	1,356	4.0	37	90.9	0.019	3.8

 $^{^{(}a)}$ July 5, 2021 was excluded due to low pulp production unrepresentative of typical operation.

Attachment IPT11 Table I-1

Comparison of Original and Duplicate Data - Total Reduced Sulfur - Method RSK-175^(a)

			Н	lydrogen Sulf	fide	Di	methyl Disul	fide		Dimethyl Sulf	ide	M	ethyl Mercapta	an	
Sample Location	Date	Time	Original Result (ppb)	Duplicate Result (ppb)	Percent Difference	Original Result (ppb)	Duplicate Result (ppb)	Percent Difference	Original Result (ppb)	Duplicate Result (ppb)	Percent Difference	Original	Duplicate Result (ppb)	Percent	Notes
5A-ASB Zone 1	7/9/2021	8:45 AM	N/A	13,038		1.0	1,006	99874%	1.9	339	18239%	104	113	9%	Duplicate for DMDS and DMS are not included in the average because the method reporting limit is greater than the measured value.
	7/10/2021	9:39 AM	26,832	5,100	-81%	1.8	4.6	150%	25.9	20.4	-21%	157	98.1	-38%	
5B-ASB Zone 2	7/9/2021	9:25 AM	N/A	863		1.6	1,006	61226%	8.2	339	4037%	29.0	113	291%	Duplicate for DMDS, DMS, and MMC are not included in the average because the method reporting limit is greater than the measured value.
	7/10/2021	8:31 AM	4,201	3,509	-16%	1.2	1.6	30%	2.4	3.2	34%	37.6	50.1	33%	
5C ACD 7	7/9/2021	9:53 AM	10.6	37.4	253%	1.0	1.0	0%	0.34	0.34	0%	0.13	0.40	198%	
5C-ASB Zone 3	7/10/2021	8:14 AM	3.9	0.64	-84%	1.0	1.0	0%	0.34	0.34	1%	0.11	0.11	1%	
4A-Post-Aeration Tank Inlet	7/10/2021	10:11 AM	0.26	1.4	445%	1.0	1.0	0%	0.34	2.3	573%	0.11	0.11	0%	
4B-Post-Aeration Tank Surface	7/10/2021	10:21 AM	0.84	0.41	-51%	1.0	1.0	0%	0.34	0.34	0%	0.11	0.11	0%	
4C-Post-Aeration Tank Outelt	7/10/2021	10:23 AM	0.74	1.5	97%	1.0	1.0	0%	0.34	2.1	514%	0.11	0.11	1%	
	7/9/2021	8:00 AM	0.10	19.9	19603%	1.0	1.0	0%	24.7	8.8	-64%	0.11	0.43	281%	
1A ASB Influent	7/9/2021	5:40 PM	1,479	2.3	-100%	8,637	28.8	-100%	1,669	39.3	-98%	936	0.20	-100%	The original results were above the calibration range and are not included in the average.
1B ASB Effluent	7/9/2021	8:00 AM	6.1	0.36	-94%	2.3	1.1	-51%	27.0	8.0	-70%	0.11	0.32	185%	
16 ASB Elliuent	7/9/2021	5:45 PM	7.6	4.4	-42%	1.0	1.0	0%	2.8	3.0	9%	0.80	0.97	21%	
	7/9/2021	8:00 AM	N/A	130,032		N/A	6,427		N/A	5,687		N/A	5,232		
2A Foul Condensate	7/9/2021	5:00 PM	156,776	14.2	-100%	9,527	1.0	-100%	5,737	0.34	-100%	12,242	0.26	-100%	Duplicate not averaged because so low in comparison with other samples.
2B Stripped Condensate	7/9/2021	8:05 AM	N/A	12,100		1,968	10,057	411%	1,268	3,392	168%	204	1,133	456%	Duplicate is not averaged because the method reporting limit is greater than the measured value.
	7/9/2021	5:05 PM	99,291	9,138	-91%	4,252	2,551	-40%	796	1,571	97%	1,144	135	-88%	

⁽a) Results in **bold** font were outside of the calibration range, and the laboratory report indicated that results should be considered estimated. Results in italic font were below the method reporting limit (MRL). The results have been reported at the MRL. "N/A" is reported where results "peaked out." Results in grey shading were not averaged.

IPT COMMENT 11 REVISED TRS COMPOUND FBIO CALCULATIONS ASB H2SSIM RUNS

NCASI WASTEWATER HYDROGEN SULFIDE EMISSIONS SIMULATOR (H2SSIM) Version 1.3

7/9/2021

Data '	Гуре	1.	Site	lden	tif	icati	on
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Company Name	New-Indy
Facility Name	Catawba SC
Basin Name	ASB

Data Type 2. Model Zone Information

Number of Zones	3	T
Zone Location of Hardpipe	1	•
Type of Basin	ASB	-

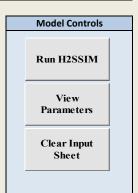
Data Type 3. Load Characteristics

Loading	Main		
Characteristics	Influent	Hardpipe	Units
Flow	21.66	0.33	MGD -
Total Sulfide	0.0254	114.2	mg/L 🔻
Sulfate	390	390	mg/L ▼

Data Type 4. Atmospheric Conditions

Windspeed	3.79	mph	_
Ambient Temperature	79	F	-

Zone Condition	Zone 1	Zone 2	Zone 3	Zone 4	Units
Dissolved Oxygen	0.69	0.29	2		mg/L
Temperature	95.8	89.2	87.2		F ▼
рН	8.75	8.57	8.74		s.u.
Redox Condition	Aerobic 🔽	Aerobic 🔻	Aerobic -	Aerobic 🔻	
Length	739	1196	1248		feet 🔻
Width	739	598	624		feet 🔻
Depth	4.5	3.2	3		feet
Mixing	Moderat ▼	Moderat ▼	Moderat ▼		
Number of Aerators	16	15	6		
Total Horsepower	1200	1125	450		НР
Impellor Size	1.625	1.625	1.625		feet 🔻
Impellor RPM	1200	1200	1200		RPM
Diffused Air Flow	0	0	0		cms
Weir Height	0	0	0		feet 🔻



H2SSIM Results 7/9/2021

Basin Emissions		Units
Total Emissions (H ₂ S)	0.071	gms/s
Total Emissions (H ₂ S)	4954.0	lbs/yr
Total Emissions (H ₂ S)	2.5	tons/yr
Total Emissions (H ₂ S)	2.2	tonnes/yr
Emission Flux (H ₂ S)	11.9	gms/m² yr

Zone Emissions	Zone 1	Zone 2	Zone 3	Zone 4	Units
Zone Emissions (H ₂ S)	0.02	0.03	0.02		gms/s
Zone Emissions (H ₂ S)	1640.4	1735.9	1577.6		lbs/yr
Emission Flux (H ₂ S)	14.7	11.9	9.9		gms/m ² yr
Liquid Conc. (Total Sulfide)	0.010	0.008	0.001		mg/L
Liquid Sulfide Load (lbs/yr)	105.700	87.000	9.900		lbs/yr

Current Parameters				
kgen 0.25				
ThetaGen	1.06			
KDO	0.05			
KSO4 10				
kanox 0.006				
ThetaOx	1.05			
m	1			
n	0.2			
MLVSS	196.11			
O ₂ Transfer Coeff.	2			
alpha 1 0.83				
alpha 2	0.6			

Percent Inlet Sulfide Removed

NCASI WASTEWATER HYDROGEN SULFIDE EMISSIONS SIMULATOR (H2SSIM)

7/10/2021

Data Type 1. Site Identification

Company Name	New-Indy	
Facility Name	Catawba SC	
Basin Name	ASB	

Data Type 2. Model Zone Information

Number of Zones	3	-
Zone Location of Hardpipe	1	4
Type of Basin	ASB	•

Data Type 3. Load Characteristics

Loading	Main		
Characteristics	Influent	Hardpipe	Units
Flow	21.58	0.35	MGD -
Total Sulfide	0.0125	96.94	mg/L 🔻
Sulfate	390	390	mg/L ▼

Data Type 4. Atmospheric Conditions

Windspeed	3.79	mph	_
Ambient Temperature	79	F	-

Zone Condition	Zone 1	Zone 2	Zone 3	Zone 4	Units
Dissolved Oxygen	0.06	0.05	1.5		mg/L
Temperature	97.16	89.6	87.8		F 🔻
рН	8.08	8.39	8.38		s.u.
Redox Condition	Aerobic 🔽	Aerobic 🔻	Aerobic -	Aerobic -	
Length	739	1196	1248		feet 🔻
Width	739	598	624		feet 🔻
Depth	4.5	3.2	3		feet
Mixing	Moderat	Moderat▼	Moderat ▼		
Number of Aerators	16	15	6		
Total Horsepower	1200	1125	450		НР
Impellor Size	1.625	1.625	1.625		feet 🔻
Impellor RPM	1200	1200	1200		RPM
Diffused Air Flow	0	0	0		cms 🔻
Weir Height	0	0	0		feet 🕶



H2SSIM Results 7/10/2021

Basin Emissions		Units
Total Emissions (H ₂ S)	0.144	gms/s
Total Emissions (H ₂ S)	9998.9	lbs/yr
Total Emissions (H ₂ S)	5.0	tons/yr
Total Emissions (H ₂ S)	4.5	tonnes/yr
Emission Flux (H ₂ S)	23.9	gms/m² yr

Zone Emissions	Zone 1	Zone 2	Zone 3	Zone 4	Units
Zone Emissions (H ₂ S)	0.08	0.04	0.02		gms/s
Zone Emissions (H ₂ S)	5359.9	3014.2	1624.9		lbs/yr
Emission Flux (H ₂ S)	47.9	20.6	10.2		gms/m ² yr
Liquid Conc. (Total Sulfide)	0.047	0.041	0.002		mg/L
Liquid Sulfide Load (lbs/yr)	493.300	429.100	16.400		lbs/yr

Zone Emissions (1128)	0.00	0.04	0.02	δ
Zone Emissions (H ₂ S)	5359.9	3014.2	1624.9	II
Emission Flux (H ₂ S)	47.9	20.6	10.2	gm
Liquid Conc. (Total Sulfide)	0.047	0.041	0.002	r
Liquid Sulfide Load (lbs/yr)	493.300	429.100	16.400	II
Percent Inlet Sulfide Removed	90.4%			

Current Parameters				
kgen	0.25			
ThetaGen	1.06			
KDO	0.05			
KSO4	10			
kanox	0.006			
ThetaOx	1.05			
m	1			
n	0.2			
MLVSS	232.67			
O ₂ Transfer Coeff.	2			
alpha 1	0.83			
alpha 2	0.6			

NCASI WASTEWATER HYDROGEN SULFIDE EMISSIONS SIMULATOR (H2SSIM) Version 1.3

7/11/2021

Data	Type	1.	Site	Ide	enti	itica	tior
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Company Name	New-Indy
Facility Name	Catawba SC
Basin Name	ASB

Data Type 2. Model Zone Information

Number of Zones	3	
Zone Location of Hardpipe	1	
Type of Basin	ASB	4

Data Type 3. Load Characteristics

Loading	Main		
Characteristics	Influent	Hardpipe	Units
Flow	20.82	0.33	MGD -
Total Sulfide	0.014	46.86	mg/L 🔻
Sulfate	390	390	mg/L ▼

Data Type 4. Atmospheric Conditions

Windspeed	3.79	mph	-
Ambient Temperature	79	F	

Zone Condition	Zone 1	Zone 2	Zone 3	Zone 4	Units
Dissolved Oxygen	0.11	0.11	1		mg/L
Temperature	93.32	92	89.54		F 🔻
рН	8.02	8.01	7.99		s.u.
Redox Condition	Aerobic 🔽	Aerobic 🔻	Aerobic -	Aerobic -	
Length	739	1196	1248		feet 🔻
Width	739	598	624		feet 🔻
Depth	4.5	3.2	3		feet
Mixing	Moderat	Moderat▼	Moderat ▼		
Number of Aerators	16	15	6		
Total Horsepower	1200	1125	450		HP
Impellor Size	1.625	1.625	1.625		feet 🔻
Impellor RPM	1200	1200	1200		RPM
Diffused Air Flow	0	0	0		cms ▼
Weir Height	0	0	0		feet 🔻



H2SSIM Results 7/11/2021

Basin Emissions		Units
Total Emissions (H ₂ S)	0.133	gms/s
Total Emissions (H ₂ S)	9276.1	lbs/yr
Total Emissions (H ₂ S)	4.6	tons/yr
Total Emissions (H ₂ S)	4.2	tonnes/yr
Emission Flux (H ₂ S)	22.2	gms/m ² yr

Zone Emissions	Zone 1	Zone 2	Zone 3	Zone 4	Units
Zone Emissions (H ₂ S)	0.05	0.05	0.03		gms/s
Zone Emissions (H ₂ S)	3851.1	3647.0	1778.0		lbs/yr
Emission Flux (H ₂ S)	34.4	24.9	11.1		gms/m ² yr
Liquid Conc. (Total Sulfide)	0.028	0.024	0.002		mg/L
Liquid Sulfide Load (lbs/yr)	287.900	239.000	24.800		lbs/yr

Liquid Suffice Load (108/y1)	267.900
Percent Inlet Sulfide Removed	80.6%

Current Para	ameters
kgen	0.25
ThetaGen	1.06
KDO	0.05
KSO4	10
kanox	0.006
ThetaOx	1.05
m	1
n	0.2
MLVSS	272.2
O ₂ Transfer Coeff.	2
alpha 1	0.83
alpha 2	0.6

IPT COMMENT 11 REVISED TRS COMPOUND FBIO CALCULATIONS POST-ASB H2SSIM RUNS

NCASI WASTEWATER HYDROGEN SULFIDE EMISSIONS SIMULATOR (H2SSIM) Version 1.3

Data T	ype 1.	Site Id	dentification
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Company Name	New-Indy	
Facility Name	Catawba SC	
Basin Name	Post ASB Tank	

Data Type 2. Model Zone Information

Number of Zones	1
Zone Location of Hardpipe	None _
Type of Basin	ASB 🗕

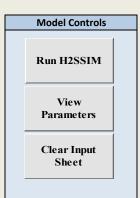
Data Type 3. Load Characteristics

Loading Characteristics	Main Influent	Hardpipe	Units
Flow	25.1	пагарірс	MGD -
		0	
Total Sulfide	0.0025	0	mg/L 🔻
Sulfate	390	0	mg/L 🔻

Data Type 4. Atmospheric Conditions

Windspeed	3.79	mph -]
Ambient Temperature	79	F -	

Zone Condition	Zone 1	Zone 2	Zone 3	Zone 4	Units	
Dissolved Oxygen	0.25				mg/L	
Temperature	85.2				F	T
рН	7.67				s.u.	
Redox Condition	Aerobic 🔽	Aerobic -	Aerobic -	Aerobic -		
Length	60				feet	Ŧ
Width	40				feet	•
Depth	15				feet	T
Mixing	High ▼	Modera	Moderat			
Number of Aerators	3					
Total Horsepower	234				НР	
Impellor Size	1.625				feet	T
Impellor RPM	1200				RPM	
Diffused Air Flow	0				cms	T
Weir Height	0				meters	Ŧ



H2SSIM Results 7/9/2021

Basin Emissions		Units
Total Emissions (H ₂ S)	0.002	gms/s
Total Emissions (H ₂ S)	152.1	lbs/yr
Total Emissions (H ₂ S)	0.1	tons/yr
Total Emissions (H ₂ S)	0.1	tonnes/yr
Emission Flux (H ₂ S)	309.3	gms/m² yr

Zone Emissions	Zone 1	Zone 2	Zone 3	Zone 4	Units
Zone Emissions (H ₂ S)	0.00				gms/s
Zone Emissions (H ₂ S)	152.1				lbs/yr
Emission Flux (H ₂ S)	309.3				gms/m ² yr
Liquid Conc. (Total Sulfide)	0.007				mg/L
Liquid Sulfide Load (lbs/yr)	87.100				lbs/yr

Current Par	ameters
kgen	0.25
ThetaGen	1.06
KDO	0.05
KSO4	10
kanox	0.006
ThetaOx	1.05
m	1
n	0.2
MLVSS	2500
O ₂ Transfer Coeff.	1.24
alpha 1	0.83
alpha 2	0.6

	Percent Inlet Sulfide Removed	-25.2%
--	-------------------------------	--------

7/10/2021

NCASI WASTEWATER HYDROGEN SULFIDE EMISSIONS SIMULATOR (H2SSIM) Version 1.3

Data Type 1. Site Identification

Company Name	New-Indy
Facility Name	Catawba SC
Basin Name	Post ASB Tank

Data Type 2. Model Zone Information

Number of Zones	1
Zone Location of Hardpipe	None _
Type of Basin	ASB 💂

Data Type 3. Load Characteristics

Loading	Main		
Characteristics	Influent	Hardpipe	Units
Flow	24.7	0	MGD -
Total Sulfide	0.00083	0	mg/L 🔻
Sulfate	390	0	mg/L 🔻

Data Type 4. Atmospheric Conditions

Windspeed	3.79	mph	•
Ambient Temperature	79	F	

Zone Condition	Zone 1	Zone 2	Zone 3	Zone 4	Units	
Dissolved Oxygen	0.53				mg/L	
Temperature	84.5				F	굣
рН	7.69				s.u.	
Redox Condition	Aerobic 🔽	Aerobic -	Aerobic -	Aerobic -		
Length	60				feet	F
Width	40				feet	·
Depth	15				feet	F
Mixing	High ▼	Moderat▼	Moderat			
Number of Aerators	3					
Total Horsepower	234				НР	
Impellor Size	1.625				feet	T
Impellor RPM	1200				RPM	
Diffused Air Flow	0				cms	T
Weir Height	0				meters	Ŧ



H2SSIM Results 7/10/2021

Basin Emissions		Units
Total Emissions (H ₂ S)	0.001	gms/s
Total Emissions (H ₂ S)	68.0	lbs/yr
Total Emissions (H ₂ S)	0.0	tons/yr
Total Emissions (H ₂ S)	0.0	tonnes/yr
Emission Flux (H ₂ S)	138.3	gms/m² yr

Zone Emissions	Zone 1	Zone 2	Zone 3	Zone 4	Units
Zone Emissions (H ₂ S)	0.00				gms/s
Zone Emissions (H ₂ S)	68.0				lbs/yr
Emission Flux (H ₂ S)	138.3				gms/m ² yr
Liquid Conc. (Total Sulfide)	0.003				mg/L
Liquid Sulfide Load (lbs/yr)	38.700				lbs/yr

Current Parameters			
kgen	0.25		
ThetaGen	1.06		
KDO	0.05		
KSO4	10		
kanox	0.006		
ThetaOx	1.05		
m	1		
n	0.2		
MLVSS	2500		
O ₂ Transfer Coeff.	1.24		
alpha 1	0.83		
alpha 2	0.6		

Percent Inlet Sulfide Removed -70.9%

NCASI WASTEWATER HYDROGEN SULFIDE EMISSIONS SIMULATOR (H2SSIM) Version 1.3

Company Name	New-Indy
Facility Name	Catawba SC
Basin Name	Post ASB Tank

Data Type 2. Model Zone Information

Number of Zones	1
Zone Location of	None _
Hardpipe	
Type of Basin	ASB -

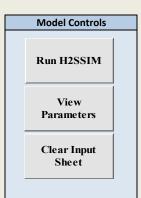
Data Type 3. Load Characteristics

Loading	Main		
Characteristics	Influent	Hardpipe	Units
Flow	19.3	0	MGD -
Total Sulfide	0.0018	0	mg/L 🔻
Sulfate	390	0	mg/L 🔻

Data Type 4. Atmospheric Conditions

Windspeed	3.79	mph	•
Ambient Temperature	79	F	

Zone Condition	Zone 1	Zone 2	Zone 3	Zone 4	Units	
Dissolved Oxygen	3.68				mg/L	
Temperature	84.5				F	₹
рН	7.6				s.u.	
Redox Condition	Aerobic 🔽	Aerobic -	Aerobic -	Aerobic -		
Length	60				feet	Ŧ
Width	40				feet	•
Depth	15				feet	F
Mixing	High ▼	Modera	Moderat			
Number of Aerators	3					
Total Horsepower	234				НР	
Impellor Size	1.625				feet	T
Impellor RPM	1200				RPM	
Diffused Air Flow	0				cms	T
Weir Height	0				meters	Ŧ



H2SSIM Results 7/11/2021

Basin Emissions		Units
Total Emissions (H ₂ S)	0.000	gms/s
Total Emissions (H ₂ S)	21.9	lbs/yr
Total Emissions (H ₂ S)	0.0	tons/yr
Total Emissions (H ₂ S)	0.0	tonnes/yr
Emission Flux (H ₂ S)	44.7	gms/m² yr

Zone Emissions	Zone 1	Zone 2	Zone 3	Zone 4	Units
Zone Emissions (H ₂ S)	0.00				gms/s
Zone Emissions (H ₂ S)	21.9				lbs/yr
Emission Flux (H ₂ S)	44.7				gms/m ² yr
Liquid Conc. (Total Sulfide)	0.001				mg/L
Liquid Sulfide Load (lbs/yr)	7.100				lbs/yr

Current Parameters			
Current Parameters			
kgen	0.25		
ThetaGen	1.06		
KDO	0.05		
KSO4	10		
kanox	0.006		
ThetaOx	1.05		
m	1		
n	0.2		
MLVSS	2500		
O ₂ Transfer Coeff.	1.24		
alpha 1	0.83		
alpha 2	0.6		

Percent Inlet Sulfide Removed	72.6%
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IPT COMMENT 11 REVISED TRS COMPOUND FBIO CALCULATIONS ASB WATER9 OUTPUT

Type of unit is 1 Total water added at the unit (1/s) 2 Area of openings at unit (cm2) 3 Radius of drop pipe (cm) 4 Drop length to conduit (cm) 5 Humidity of inlet air (%) 6 Temperature of air (C) 7 Drain air velocity (ft/min) 8 manhole air velocity (ft/min) 10 Wind speed (cm/s at 10 m) 11 distance to next unit (cm) 12 slope of underflow conduit 13 friction factor liquid 14 friction factor gas 15 radius of underflow conduit (cm) 16 Underflow T (C) 17 oscillation cycle time (min) 18 design collection velocities (ft/s) 19 design branch line fraction full Type of unit is 8 HL partition flag=1, adjust for sorptice 9 unit recycle convergence number 10 oil molecular weight 11 oil density (g/cc) 12 NaUT 1=municipal 2=industrial 3=turb. 13 NaUT 1=mass tr. 2=equil 14 parts biomass per 1000 parts COD 15 oil water partition method 0=owpc 16 use UNIFAC aqueous data base =1 17 specify mass transfer for unit, =1 18 Use biomass for unit option, =1 19 biogrowth Monod half concentration ppm	on	0 50 5 61 40 25 84 128 66 447 500 .015 .016 .006 12 25 5 2 .4
DETAILED CALCULATIONS at Unit 11 ASB Zone Type: aerated biotreatment Project C:\Users\akelley\Desktop\Waters Comments Run\ASB\ASB Oct 5 Response v2 10/4/202 22:20:43 COMPOUND: DIMETHYL DISULFIDE	\0ctobe	
Type of unit is aerated biotreatment 1 Description of unit 2 Wastewater temperature (C) 3 length of aeration unit (m) 4 width of aeration unit (m) 5 depth of aeration unit (m) 6 Area of agitation (each aerator, m2) 7 Total number of agitators in the unit	11	ASB Zone 1 35.2 225 225 1.4 135

```
8 Power of agitation (each aerator, HP)
                                                         49.53
      9 Impeller diameter (cm)
      10 Impeller rotation (RPM)
                                                         1200
      11 Agitator mechanical efficiency
                                                        0.83
      12 aerator effectiveness, alpha
                                                        0.83
      13 if there is plug flow, enter 1
                                                        0
      14 Overall biorate (mg/g bio-hr)
                                                        19
      15 Aeration air flow (m3/s)
                                                         0
      16 active biomass, aeration (g/1)
                                                         0.3
      17 If covered, then enter 1
      18 special input
                                                         0
      19 pH (enter 0 for no pH adjustment)
                                                         8.28
      Properties of DIMETHYL DISULFIDE at 35.2 deg.C (95.4 deg.F)
         hl = 0.001806 \text{ atm-m3/mol} vp = 48.422 \text{ mmHg} (0.93658)
psia)
             100.332 \text{ y/x}
             0.071416 g/L gas per g/L liquid
         Temperature adjustment factor = 1.046 \, (T-25), deg. C
         k1=0. L/q-hr
                                 dl = 1.045e - 05 cm2/s dv = 0.088584
cm2/s
      Compound flow rate from inlet water is 0.11846 g/s.
      Compound flow rate from inlet vent is 0. g/s.
      Compound flow rate from inlet duct is 0. g/s.
      Submerged aeration rate from inlet vent is 0. m3/s.
      Total submerged aeration is 0. m3/s.
      The residence time in the unit is 20.713 hr.
         Biomass production
          The biomass production rate is 0.mg/hr. (0. mg/L)
          The fraction dissolved solids converted is 0. .
          The estimated biomass exit concentration is 0. mg/L.
             Quiescent wind shear surface Springer
      The fetch to depth ratio is 181.347.
      kl is estimated as 5.985e-06 m/s.
      kg is estimated as 0.005792 m/s. Model: 2
      kg is estimated as 0.005792 m/s. Model: 2
      The Schmidt number is 1.69331.
      The friction velocity is 37.398 \text{ m/s}
      kg is estimated as 0.012978 m/s. Model: 3
              Agitated surface
      The rotation speed is 12\overline{5.654} radians per second.
      The rotation factor NRW is 2.052e+06.
      The power number NPR is 7.881e-04.
      The rotation factor NFR is 797.027.
      kg (agitated) is estimated as 0.11601 m/s.
      kl (agitated) is estimated as 0.017989 m/s.
          The specified and growth biomass is 0.3 \text{ g/L}.
       The effective KL (surface + diffused air) is 2.564e-04
m/s.
       The effective stripping time (surface + diffused air) is
90.994 minutes. (1.51657 hrs.)
       The pump mixing time is 5 \times 10^{-5} x the pumping recirculation time,
```

75

0. min. The ratio of the mixing to the striping (surface + diffused air) is 0. The mean residence time is 1242.781 min. (20.713 hr.) The ratio of the pump mixing to the residence time is 0. KG aerated (m/s) 0.11819 KL aerated (m/s) 0.017989 KL OVERALL AERATED (m/s) KG quiescent (m/s) KL quiescent (m/s) 0.005878 0.005901 5.985e-06 5.904e-06 KL quiescent (m/s) KL OVERALL QUIESCENT (m/s) S.904e-06 AL OVERALL (m/s) air stripping time constant (min) FRACTION SURFACE VOLATILIZED FRACTION SUBMERGED VOLATILIZED TOTAL FRACTION VOLATILIZED TOTAL FRACTION VOLATILIZED FRACTION BIOLOGICALLY REMOVED FRACTION ABSORBED TOTAL AIR EMISSIONS (g/s) TOTAL AIR EMISSIONS (g/s) 0.039572 (Mg/year) 1.24795 EMISSION FACTOR (g/cm2-s) 7.817e-11 UNIT EXIT CONCENTRATION (ppmw) 0.003048 DETAILED CALCULATIONS at Unit 12 def.system exit st Type: system exit stream Project C:\Users\akelley\Desktop\Water9\October 5 Comments Run\ASB\ASB Oct 5 Response v2 10/4/2021 7:59:10 PM 22:20:43 COMPOUND: DIMETHYL DISULFIDE Type of unit is system exit stream 1 Description of unit 12 def.system exit st TOTAL AIR EMISSIONS (g/s) 0. (Mg/year) 0. EMISSION FACTOR (g/cm2-s) 7.817e-11 UNIT EXIT CONCENTRATION (ppmw) 3.484e-06 DETAILED CALCULATIONS at Unit 13 default open hub d Type: open hub drain Project C:\Users\akelley\Desktop\Water9\October 5 Comments Run\ASB\ASB Oct 5 Response v2 10/4/2021 7:59:10 PM 22:20:43 COMPOUND: DIMETHYL DISULFIDE Type of unit is open hub drain 1 Description of unit 13 default open hub d 44.4 2 Underflow T (C) 3 Total water added at the unit (1/s) 4 Area of openings at unit (cm2) 5 Radius of drop pipe (cm) 0 50 5 Radius of drop pipe (cm) 5 6 Drop length to conduit (cm)

61

```
7 Open surface=1
      8 Subsurface entrance=1
                                                            0
      9 subsurface exit =1
                                                            0
      10 radius of underflow conduit (cm)
                                                           12
      11 distance to next unit (cm)
                                                            500
      12 slope of underflow conduit
                                                           0.015
                                                           84
      16 velocity air at drain opening (ft/min)
      17 municipal waste in conduit =1
      18 Assume equilibrium in unit, =1
      19 pH (enter 0 for no pH adjustment)
                                                            8.9
       Equilibrium partitioning in drain drop hub is assumed.
         Total drain flow is 950.489 1/s.
         Weight fraction down is 1.37709E-07
         Gas concentration in 0 mol fraction.
         Gas flow 950.489 L/s
         Weight fraction out at base of drop is
1.24628900916417E-07
         fraction transferred in the drain drop from hub
is .094984
         fraction loss in wastel drop to hub
         fraction loss in waste2 drop to hub
                                                       0.
         fraction loss in waste3 drop to hub
         fraction loss in collection hub drop
                                                      0.094984
         fraction loss in unit
                                                      0.
                                                      6.29e-08
         fraction loss in line run
         component upstream of unit, g/s
                                                      0.
         mol fract. headspace upstream (y)
headspace at conduit discharge, y
headspace end of conduit (y)
mol fract. headspace vent base
headspace flow out vent (cc/s)
headspace flow down line (cc/s)

9.505e+05
         headspace flow out vent (cc/s) headspace flow down line (cc/s)
                                                      -9.505e+05
         KG surface (m/s)
                                                      1701.612
         KL surface (m/s)
                                                       5.911e-09
         flow of waste down hub (1/s)
                                                      0.
         component flow in waste into unit (g/s) 0.13089
         total component into unit, g/s
                                                      0.11846
         TOTAL AIR EMISSIONS (g/s)
                                                      0.012433
                            (Mg/year)
                                                       0.39207
         EMISSION FACTOR (g/cm2-s) 7.817e-3
UNIT EXIT CONCENTRATION (ppmw) 0.12463
                                                      7.817e-11
      DETAILED CALCULATIONS at Unit 17 ASB Zone 3
      Type: aerated biotreatment
        Project C:\Users\akelley\Desktop\Water9\October 5
Comments Run\ASB\ASB Oct 5 Response v2 10/4/2021 7:59:10 PM
22:20:43
      COMPOUND: DIMETHYL DISULFIDE
      Type of unit is aerated biotreatment
                                                    17 ASB Zone 3
      1 Description of unit
      2 Wastewater temperature (C)
                                                            31.211
```

```
380.4
      3 length of aeration unit (m)
      4 width of aeration unit (m)
                                                        190.2
      5 depth of aeration unit (m)
                                                        0.91
      6 Area of agitation (each aerator, m2)
                                                       135
      7 Total number of agitators in the unit
      8 Power of agitation (each aerator, HP)
                                                       75
      9 Impeller diameter (cm)
                                                       49.53
      10 Impeller rotation (RPM)
                                                        1200
      11 Agitator mechanical efficiency
                                                       0.83
      12 aerator effectiveness, alpha
                                                       0.83
      13 if there is plug flow, enter 1
                                                       0
      14 Overall biorate (mg/g bio-hr)
                                                       19
      15 Aeration air flow (m3/s)
                                                        0
                                                       0.3
      16 active biomass, aeration (g/1)
      17 If covered, then enter 1
      18 special input
                                                        0
      19 pH (enter 0 for no pH adjustment)
                                                        8.37
      Properties of DIMETHYL DISULFIDE at 31.2 deg.C (88.2 deg.F)
         hl = 0.001495 \text{ atm-m3/mol} vp = 40.078 \text{ mmHg} (0.77518)
psia)
             83.042 \text{ y/x}
             0.059884 g/L gas per g/L liquid
         Temperature adjustment factor = 1.046 ^(T-25), deg. C
                                dl = 1.031e - 05 cm2/s dv = 0.086588
         k1=0. L/q-hr
cm2/s
      Compound flow rate from inlet water is 8.625e-05 g/s.
      Compound flow rate from inlet vent is 0. g/s.
      Compound flow rate from inlet duct is 0. g/s.
      Submerged aeration rate from inlet vent is 0. m3/s.
      Total submerged aeration is 0. m3/s.
      The residence time in the unit is 19.242 hr.
         Biomass production
          The biomass production rate is 0.mg/hr. (0. mg/L)
          The fraction dissolved solids converted is 0. .
          The estimated biomass exit concentration is 0. mg/L.
             Quiescent wind shear surface Springer
      The fetch to depth ratio is 333.533.
      kl is estimated as 5.934e-06 \text{ m/s}.
      kg is estimated as 0.005594 m/s. Model: 2
      kg is estimated as 0.005594 m/s. Model: 2
      The Schmidt number is 1.73233.
      The friction velocity is 37.398 m/s
      kg is estimated as 0.012797 m/s. Model: 3
             Agitated surface
      The rotation speed is 125.654 radians per second.
      The rotation factor NRW is 2.052e+06.
      The power number NPR is 7.881e-04.
      The rotation factor NFR is 797.027.
      kg (agitated) is estimated as 0.1147 m/s.
      kl (agitated) is estimated as 0.016259 m/s.
          The specified and growth biomass is 0.3 \text{ g/L}.
```

```
The effective KL (surface + diffused air) is 6.133e-05
m/s.
         The effective stripping time (surface + diffused air) is
247.292 minutes. (4.12153 hrs.)
         The pump mixing time is 5 \times 10^{-5} x the pumping recirculation time,
0. min.
         The ratio of the mixing to the striping (surface +
diffused air) is 0.
         The mean residence time is 1154.5 min. (19.242 hr.)
         The ratio of the pump mixing to the residence time is 0.
            KG aerated (m/s)
                                                                      0.11685
            KL aerated (m/s)
                                                                     0.016259
            KL OVERALL AERATED (m/s)
                                                                    0.004963
            KG quiescent (m/s)
            KG quiescent (m/s)
KL quiescent (m/s)
KL OVERALL QUIESCENT (m/s)
                                                                    0.005698
                                                                    5.934e-06
                                                                    5.834e-06
            KL OVERALL (m/s)
                                                                    6.133e-05
            air stripping time constant (min) 247.292
FRACTION SURFACE VOLATILIZED 0.17927
FRACTION SUBMERGED VOLATILIZED 0.
TOTAL FRACTION VOLATILIZED 0.17927
FRACTION BIOLOGICALLY REMOVED 0.78233

      FRACTION ABSORBED
      0.

      TOTAL AIR EMISSIONS (g/s)
      1.546e-05

      (Mg/year)
      4.876e-04

      EMISSION FACTOR (g/cm2-s)
      2.137e-14

      UNIT EXIT CONCENTRATION (ppmw)
      3.484e-06

        DETAILED CALCULATIONS at Unit 18 ASB Zone 2
        Type: aerated biotreatment
           Project C:\Users\akelley\Desktop\Water9\October 5
Comments Run\ASB\ASB Oct 5 Response v2 10/4/2021 7:59:10 PM
22:20:43
        COMPOUND: DIMETHYL DISULFIDE
        Type of unit is aerated biotreatment
        1 Description of unit
                                                                  18 ASB Zone 2
        2 Wastewater temperature (C)
                                                                            32.4
        3 length of aeration unit (m)
                                                                            365
        4 width of aeration unit (m)
                                                                           182.3
        5 depth of aeration unit (m)
                                                                           0.97
        6 Area of agitation (each aerator, m2)
7 Total number of agitators in the unit
8 Power of agitation (each aerator, HP)
                                                                           135
                                                                           15
                                                                           75
        9 Impeller diameter (cm)
                                                                           49.53
        10 Impeller rotation (KFM)
11 Agitator mechanical efficiency 0.83

finativeness, alpha 0.83
        13 if there is plug flow, enter 1
14 Overall biorate (mg/g bio-hr)
                                                                           0
```

16 active biomass, aeration (g/1)

15 Aeration air flow (m3/s)

17 If covered, then enter 1

19 0

0.3

```
18 special input
      19 pH (enter 0 for no pH adjustment)
                                                         8.33
      Properties of DIMETHYL DISULFIDE at 32.4 deg.C (90.3 deg.F)
         hl = 0.001582 atm - m3/mol
                                    vp = 42.429 \text{ mmHg} (0.82066)
psia)
             87.913 \text{ y/x}
             0.06315 \text{ g/L gas per g/L liquid}
         Temperature adjustment factor = 1.046 \, (T-25), deq. C
                                 dl = 1.035e - 05 cm2/s dv = 0.087181
         k1=0. L/q-hr
cm2/s
      Compound flow rate from inlet water is 0.002897 g/s.
      Compound flow rate from inlet vent is 0. g/s.
      Compound flow rate from inlet duct is 0. g/s.
      Submerged aeration rate from inlet vent is 0. m3/s.
      Total submerged aeration is 0. m3/s.
      The residence time in the unit is 18.863 hr.
          Biomass production
          The biomass production rate is 0.mg/hr. (0. mg/L)
          The fraction dissolved solids converted is 0. .
          The estimated biomass exit concentration is 0. mg/L.
              Quiescent wind shear surface Springer
      The fetch to depth ratio is 300.07.
      kl is estimated as 5.949e-06 \text{ m/s}.
      kg is estimated as 0.005645 m/s. Model: 2
      kg is estimated as 0.005645 m/s. Model: 2
      The Schmidt number is 1.72055.
      The friction velocity is 37.398 m/s
      kg is estimated as 0.012851 m/s. Model: 3
              Agitated surface
      The rotation speed is 125.654 radians per second.
      The rotation factor NRW is 2.052e+06.
      The power number NPR is 7.881e-04.
      The rotation factor NFR is 797.027.
      kg (agitated) is estimated as 0.11509 m/s.
      kl (agitated) is estimated as 0.016757 m/s.
          The specified and growth biomass is 0.3 \text{ g/L}.
       The effective KL (surface + diffused air) is 1.646e-04
m/s.
       The effective stripping time (surface + diffused air) is
98.199 minutes. (1.63664 hrs.)
       The pump mixing time is 5 \times 10^{-5} x the pumping recirculation time,
0. min.
       The ratio of the mixing to the striping (surface +
diffused air) is 0.
       The mean residence time is 1131.756 min. (18.863 hr.)
       The ratio of the pump mixing to the residence time is 0.
         KG aerated (m/s)
                                                    0.11725
         KL aerated (m/s)
                                                    0.016757
         KL OVERALL AERATED (m/s)
                                                    0.005223
         KG quiescent (m/s)
                                                    0.005751
         KL quiescent (m/s)
                                                    5.949e-06
```

KL OVERALL QUIESCENT (m/s)	5.855e-06
KL OVERALL (m/s)	1.646e-04
air stripping time constant (min)	98.199
FRACTION SURFACE VOLATILIZED	0.34308
FRACTION SUBMERGED VOLATILIZED	0.
TOTAL FRACTION VOLATILIZED	0.34308
FRACTION BIOLOGICALLY REMOVED	0.62716
FRACTION ABSORBED	0.
TOTAL AIR EMISSIONS (g/s)	9.94e-04
(Mg/year)	0.031348
EMISSION FACTOR (g/cm2-s)	1.494e-12
UNIT EXIT CONCENTRATION (ppmw)	9.074e-05

```
1 Total water added at the unit (1/s) 50
                                                       0
     2 Area of openings at unit (cm2)
                                                       50
     3 Radius of drop pipe (cm)
                                                       5
     4 Drop length to conduit (cm)
                                                       61
     5 Humidity of inlet air (%)
                                                       40
                                                       25
     6 Temperature of air (C)
     7 Drain air velocity (ft/min)
                                                       84
     8 manhole air velocity (ft/min)
                                                       128
     9 Conduit air velocity (ft/min)
                                                       66
     10 Wind speed (cm/s at 10 m)
                                                       447
     11 distance to next unit (cm)
                                                       500
     12 slope of underflow conduit
                                                       .015
     13 friction factor liquid
                                                       .016
                                                       .006
     14 friction factor gas
     15 radius of underflow conduit (cm)
                                                       12
     16 Underflow T (C)
                                                       25
     17 oscillation cycle time (min)
     18 design collection velocities (ft/s)
     19 design branch line fraction full
                                                      . 4
     Type of unit is
     8 HL partition flag=1, adjust for sorption
                                                       200
     9 unit recycle convergence number
     10 oil molecular weight
                                                       0
     11 oil density (q/cc)
                                                       0
     12 NaUT 1=municipal 2=industrial 3=turb.
                                                      0
     13 NaUT 1=mass tr. 2=equil
     14 parts biomass per 1000 parts COD
     15 oil water partition method 0=owpc
     16 use UNIFAC aqueous data base =1
     17 specify mass transfer for unit, =1
     18 Use biomass for unit option, =1
     19 biogrowth Monod half concentration ppm
     DETAILED CALCULATIONS at Unit 11 ASB Zone 1
     Type: aerated biotreatment
       Project C:\Users\akelley\Desktop\Water9\October 5
Comments Run\ASB\ASB Oct 5 Response v2 10/4/2021 7:59:10 PM
22:21:04
     COMPOUND: DIMETHYL SULFIDE (DMS)
     Type of unit is aerated biotreatment
     1 Description of unit
                                                11
                                                      ASB Zone 1
     2 Wastewater temperature (C)
                                                      35.2
     3 length of aeration unit (m)
                                                      225
     4 width of aeration unit (m)
                                                      225
     5 depth of aeration unit (m)
                                                     1.4
     6 Area of agitation (each aerator, m2)
                                                     135
     7 Total number of agitators in the unit
                                                     16
```

Type of unit is

```
8 Power of agitation (each aerator, HP)
                                                        49.53
      9 Impeller diameter (cm)
      10 Impeller rotation (RPM)
                                                        1200
      11 Agitator mechanical efficiency
                                                       0.83
      12 aerator effectiveness, alpha
                                                       0.83
      13 if there is plug flow, enter 1
                                                        0
      14 Overall biorate (mg/g bio-hr)
                                                        19
      15 Aeration air flow (m3/s)
                                                        Ω
      16 active biomass, aeration (g/l)
                                                        0.3
      17 If covered, then enter 1
                                                        0
      18 special input
                                                        0
      19 pH (enter 0 for no pH adjustment)
                                                        8.28
      Properties of DIMETHYL SULFIDE (DMS) at 35.2 deg.C (95.4
deq.F)
         hl = 0.003045 \text{ atm-m3/mol} vp = 733.622 \text{ mmHg} (14.19)
psia)
             169.142 y/x
             0.1204 g/L gas per g/L liquid
         Temperature adjustment factor = 1.046 ^(T-25), deg. C
                                dl= 1.51e-05 cm2/s dv= 0.14859
         k1=0. L/g-hr
cm2/s
      Compound flow rate from inlet water is 0.10355 g/s.
      Compound flow rate from inlet vent is 0. g/s.
      Compound flow rate from inlet duct is 0. g/s.
      Submerged aeration rate from inlet vent is 0. m3/s.
      Total submerged aeration is 0. m3/s.
      The residence time in the unit is 20.713 hr.
          Biomass production
          The biomass production rate is 0.mg/hr. (0. mg/L)
          The fraction dissolved solids converted is 0. .
          The estimated biomass exit concentration is 0. mg/L.
             Quiescent wind shear surface Springer
      The fetch to depth ratio is 181.347.
      kl is estimated as 7.652e-06 \text{ m/s}.
      kg is estimated as 0.008191 m/s. Model: 2
      kg is estimated as 0.008191 m/s. Model: 2
      The Schmidt number is 1.00946.
      The friction velocity is 37.398 \text{ m/s}
      kg is estimated as 0.017945 m/s. Model: 3
              Agitated surface
      The rotation speed is 125.654 radians per second.
      The rotation factor NRW is 2.052e+06.
      The power number NPR is 7.881e-04.
      The rotation factor NFR is 797.027.
      kg (agitated) is estimated as 0.15025 m/s.
      kl (agitated) is estimated as 0.021629 m/s.
          The specified and growth biomass is 0.3 g/L.
       The effective KL (surface + diffused air) is 4.396e-04
m/s.
       The effective stripping time (surface + diffused air) is
53.083 minutes. (0.88472 hrs.)
```

75

The pump mixing time is 5 x the pumping recirculaion time, 0. min. The ratio of the mixing to the striping (surface + diffused air) is 0. The mean residence time is 1242.781 min. (20.713 hr.) The ratio of the pump mixing to the residence time is 0. KG aerated (m/s) 0.15307 KL aerated (m/s)0.021629 KL OVERALL AERATED (m/s) 0.010132 KG quiescent (m/s) 0.008345 KL quiescent (m/s) 7.652e-06 KL OVERALL QUIESCENT (m/s) 7.596e-06 KL OVERALL (m/s) 4.396e-04 air stripping time constant (min) 53.083 FRACTION SURFACE VOLATILIZED 0.77235 FRACTION SUBMERGED VOLATILIZED 0. 0.77235 TOTAL FRACTION VOLATILIZED FRACTION BIOLOGICALLY REMOVED 0.19466 FRACTION ABSORBED 0. TOTAL AIR EMISSIONS (g/s)

(Mg/year)

EMISSION FACTOR (g/cm2-s)

UNIT EXIT CONCENTRATION (ppmw)

0.07998
2.52225
1.58e-10
0.003594 DETAILED CALCULATIONS at Unit 12 def.system exit st Type: system exit stream Project C:\Users\akelley\Desktop\Water9\October 5 Comments Run\ASB\ASB Oct 5 Response v2 10/4/2021 7:59:10 PM COMPOUND: DIMETHYL SULFIDE (DMS) Type of unit is system exit stream 1 Description of unit 12 def.system exit st TOTAL AIR EMISSIONS (g/s) 0. 0. (Mg/year) EMISSION FACTOR (q/cm2-s) 1.58e-10 UNIT EXIT CONCENTRATION (ppmw) 1.009e-05 DETAILED CALCULATIONS at Unit 13 default open hub d Type: open hub drain Project C:\Users\akelley\Desktop\Water9\October 5 Comments Run\ASB\ASB Oct 5 Response v2 10/4/2021 7:59:10 PM 22:21:04 COMPOUND: DIMETHYL SULFIDE (DMS) Type of unit is open hub drain 1 Description of unit 13 default open hub d 2 Underflow T (C) 44.4 3 Total water added at the unit (1/s) \cap 50 4 Area of openings at unit (cm2) 5 Radius of drop pipe (cm)

```
6 Drop length to conduit (cm)
                                                     61
     7 Open surface=1
                                                     1
     8 Subsurface entrance=1
                                                     0
     9 subsurface exit =1
                                                    0
     10 radius of underflow conduit (cm)
                                                    12
     11 distance to next unit (cm)
                                                    500
     12 slope of underflow conduit
                                                    0.015
                                                    84
     16 velocity air at drain opening (ft/min)
     17 municipal waste in conduit =1
                                                    0
     18 Assume equilibrium in unit, =1
     19 pH (enter 0 for no pH adjustment)
                                                    8.9
      Equilibrium partitioning in drain drop hub is assumed.
        Total drain flow is 950.489 1/s.
        Weight fraction down is 1.26472E-07
        Gas concentration in 0 mol fraction.
        Gas flow 950.489 L/s
        Weight fraction out at base of drop is
1.08947962902627E-07
        fraction transferred in the drain drop from hub
is .138561
        fraction loss in wastel drop to hub
                                                0.
        fraction loss in waste2 drop to hub
                                                0.
        fraction loss in waste3 drop to hub
                                               0.
        fraction loss in collection hub drop
                                               0.13856
        fraction loss in unit
                                               0.
        fraction loss in line run
                                               -7.195e-08
        2.837e-19
                                               7.346e-06
                                               -9.505e+05
                                           9.505e+05
2402.706
        headspace flow down line (cc/s)
        KG surface (m/s)
        KL surface (m/s)
                                               7.651e-09
        flow of waste down hub (1/s)
                                               0.
        component flow in waste into unit (g/s) 0.12021
        total component into unit, g/s
TOTAL AIR EMISSIONS (g/s)
                                                0.10355
                                                0.016656
        (Mg/year)
EMISSION FACTOR (g/cm2-s)
                                               0.52528
                                               1.58e-10
        UNIT EXIT CONCENTRATION (ppmw)
                                                0.10895
     DETAILED CALCULATIONS at Unit 17 ASB Zone 3
     Type: aerated biotreatment
       Project C:\Users\akelley\Desktop\Water9\October 5
Comments Run\ASB\ASB Oct 5 Response v2 10/4/2021 7:59:10 PM
22:21:04
     COMPOUND: DIMETHYL SULFIDE (DMS)
     Type of unit is aerated biotreatment
                                             17 ASB Zone 3
     1 Description of unit
```

```
2 Wastewater temperature (C)
                                                       31.211
      3 length of aeration unit (m)
                                                       380.4
      4 width of aeration unit (m)
                                                       190.2
      5 depth of aeration unit (m)
                                                       0.91
      6 Area of agitation (each aerator, m2)
                                                       135
      7 Total number of agitators in the unit
      8 Power of agitation (each aerator, HP)
                                                       75
                                                       49.53
      9 Impeller diameter (cm)
      10 Impeller rotation (RPM)
                                                       1200
      11 Agitator mechanical efficiency
                                                       0.83
      12 aerator effectiveness, alpha
                                                       0.83
      13 if there is plug flow, enter 1
                                                       \Omega
      14 Overall biorate (mg/g bio-hr)
                                                       19
      15 Aeration air flow (m3/s)
                                                       0
      16 active biomass, aeration (g/1)
                                                       0.3
      17 If covered, then enter 1
                                                       0
      18 special input
      19 pH
            (enter 0 for no pH adjustment)
                                                        8.37
      Properties of DIMETHYL SULFIDE (DMS) at 31.2 deg.C (88.2
deg.F)
        hl = 0.002634 \text{ atm-m3/mol} vp = 634.599 \text{ mmHg} (12.274)
psia)
             146.312 \text{ y/x}
             0.10551 g/L gas per g/L liquid
         Temperature adjustment factor = 1.046 ^(T-25), deg. C
                                dl= 1.49e-05 cm2/s dv= 0.14525
         k1=0. L/q-hr
cm2/s
      Compound flow rate from inlet water is 1.317e-04 g/s.
      Compound flow rate from inlet vent is 0. g/s.
      Compound flow rate from inlet duct is 0. g/s.
      Submerged aeration rate from inlet vent is 0. m3/s.
      Total submerged aeration is 0. m3/s.
      The residence time in the unit is 19.242 hr.
          Biomass production
          The biomass production rate is 0.mg/hr. (0. mg/L)
          The fraction dissolved solids converted is 0. .
          The estimated biomass exit concentration is 0. mg/L.
              Quiescent wind shear surface Springer
      The fetch to depth ratio is 333.533.
      kl is estimated as 7.586e-06 m/s.
      kg is estimated as 0.00791 m/s. Model: 2
      kg is estimated as 0.00791 m/s. Model: 2
      The Schmidt number is 1.03272.
      The friction velocity is 37.398 \text{ m/s}
      kg is estimated as 0.017688 m/s. Model: 3
             Agitated surface
      The rotation speed is 125.654 radians per second.
      The rotation factor NRW is 2.052e+06.
      The power number NPR is 7.881e-04.
      The rotation factor NFR is 797.027.
      kg (agitated) is estimated as 0.14855 m/s.
```

```
The specified and growth biomass is 0.3 g/L.
          The effective KL (surface + diffused air) is 1.069e-04
m/s.
         The effective stripping time (surface + diffused air) is
141.812 minutes. (2.36353 hrs.)
         The pump mixing time is 5 \times 10^{-5} x the pumping recirculation time,
0. min.
         The ratio of the mixing to the striping (surface +
diffused air) is 0.
          The mean residence time is 1154.5 min. (19.242 hr.)
          The ratio of the pump mixing to the residence time is 0.
            KG aerated (m/s)
                                                                       0.15134
             KL aerated (m/s)
                                                                        0.019549
            KL OVERALL AERATED (m/s)
KG quiescent (m/s)
KL quiescent (m/s)
                                                                        0.008889
                                                                        0.008059
            KL quiescent (m/s)

KL OVERALL QUIESCENT (m/s)

KL OVERALL (m/s)

air stripping time constant (min)

FRACTION SURFACE VOLATILIZED

TOTAL FRACTION VOLATILIZED

0.59325
                                                                        7.586e-06
            TOTAL FRACTION VOLATILIZED

TOTAL FRACTION VOLATILIZED

FRACTION BIOLOGICALLY REMOVED

FRACTION ABSORBED

TOTAL AIR EMISSIONS (g/s)

(Mg/year)

(Mg/year)

EMISSION FACTOR (g/cm2-s)

UNIT EXIT CONCENTRATION (ppmw)

TALLED CALCULATIONS of White 19 ACC. Care Concentration

TOTAL FRACTION VOLATILIZED

0.59325

0.33388

7.81e-05

0.002463

1.08e-13

1.009e-05
        DETAILED CALCULATIONS at Unit 18 ASB Zone 2
        Type: aerated biotreatment
           Project C:\Users\akelley\Desktop\Water9\October 5
Comments Run\ASB\ASB Oct 5 Response v2 10/4/2021 7:59:10 PM
22:21:04
        COMPOUND: DIMETHYL SULFIDE (DMS)
        Type of unit is aerated biotreatment
        1 Description of unit
                                                                     18
                                                                              ASB Zone 2
        2 Wastewater temperature (C)
                                                                                32.4
        3 length of aeration unit (m)
                                                                               365
        4 width of aeration unit (m)
                                                                              182.3
        5 depth of aeration unit (m)
6 Area of agitation (each aerator, m2)
7 Total number of agitators in the unit
8 Power of agitation (each aerator, HP)
        5 depth of aeration unit (m)
                                                                              0.97
                                                                              135
                                                                              15
                                                                              75
        9 Impeller diameter (cm)
                                                                              49.53
        10 Impeller rotation (KFF),
11 Agitator mechanical efficiency 0.83
0.83
        10 Impeller rotation (RPM)
                                                                               1200
        13 if there is plug flow, enter 1
14 Overall biorate (mg/g bio-hr)
                                                                              0
                                                                              19
        15 Aeration air flow (m3/s)
```

kl (agitated) is estimated as 0.019549 m/s.

```
0.3
      16 active biomass, aeration (g/1)
      17 If covered, then enter 1
                                                         0
      18 special input
                                                         0
             (enter 0 for no pH adjustment)
                                                         8.33
      19 pH
      Properties of DIMETHYL SULFIDE (DMS) at 32.4 deg.C (90.3
deq.F)
         hl = 0.002751 atm - m3/mol
                                  vp = 662.92 \text{ mmHg} (12.822)
psia)
             152.841 y/x
             0.10979 g/L gas per g/L liquid
         Temperature adjustment factor = 1.046 \, (T-25), deg. C
                                 dl = 1.496e - 05 cm2/s dv = 0.14624
         k1=0. L/q-hr
cm2/s
      Compound flow rate from inlet water is 0.003416 g/s.
      Compound flow rate from inlet vent is 0. g/s.
      Compound flow rate from inlet duct is 0. g/s.
      Submerged aeration rate from inlet vent is 0. m3/s.
      Total submerged aeration is 0. m3/s.
      The residence time in the unit is 18.863 hr.
          Biomass production
          The biomass production rate is 0.mg/hr. (0. mg/L)
          The fraction dissolved solids converted is 0. .
          The estimated biomass exit concentration is 0. mg/L.
             Quiescent wind shear surface Springer
      The fetch to depth ratio is 300.07.
      kl is estimated as 7.606e-06 \text{ m/s}.
      kg is estimated as 0.007983 m/s. Model: 2
      kg is estimated as 0.007983 m/s. Model: 2
      The Schmidt number is 1.0257.
      The friction velocity is 37.398 \text{ m/s}
      kg is estimated as 0.017764 m/s. Model: 3
             Agitated surface
      The rotation speed is 125.654 radians per second.
      The rotation factor NRW is 2.052e+06.
      The power number NPR is 7.881e-04.
      The rotation factor NFR is 797.027.
      kg (agitated) is estimated as 0.14906 m/s.
      kl (agitated) is estimated as 0.020147 m/s.
          The specified and growth biomass is 0.3 \text{ g/L}.
       The effective KL (surface + diffused air) is 2.887e-04
m/s.
       The effective stripping time (surface + diffused air) is
56.001 minutes. (0.93335 hrs.)
       The pump mixing time is 5 \times 10^{-5} x the pumping recirculation time,
       The ratio of the mixing to the striping (surface +
diffused air) is 0.
       The mean residence time is 1131.756 min. (18.863 hr.)
       The ratio of the pump mixing to the residence time is 0.
         KG aerated (m/s)
                                                    0.15185
         KL aerated (m/s)
                                                    0.020147
```

KL OVERALL AERATED (m/s)	0.009246
, ,	
KG quiescent (m/s)	0.008133
KL quiescent (m/s)	7.606e-06
KL OVERALL QUIESCENT (m/s)	7.543e-06
KL OVERALL (m/s)	2.887e-04
air stripping time constant (min)	56.001
FRACTION SURFACE VOLATILIZED	0.77885
FRACTION SUBMERGED VOLATILIZED	0.
TOTAL FRACTION VOLATILIZED	0.77885
FRACTION BIOLOGICALLY REMOVED	0.18261
FRACTION ABSORBED	0.
TOTAL AIR EMISSIONS (g/s)	0.002661
(Mg/year)	0.083908
EMISSION FACTOR (g/cm2-s)	3.999e-12
UNIT EXIT CONCENTRATION (ppmw)	1.385e-04

Type of unit is 1 Total water added at the unit (1/s) 2 Area of openings at unit (cm2) 3 Radius of drop pipe (cm) 4 Drop length to conduit (cm) 5 Humidity of inlet air (%) 6 Temperature of air (C) 7 Drain air velocity (ft/min) 8 manhole air velocity (ft/min) 9 Conduit air velocity (ft/min) 10 Wind speed (cm/s at 10 m) 11 distance to next unit (cm) 12 slope of underflow conduit 13 friction factor liquid 14 friction factor gas 15 radius of underflow conduit (cm) 16 Underflow T (C) 17 oscillation cycle time (min) 18 design collection velocities (ft/s 19 design branch line fraction full Type of unit is 8 HL partition flag=1, adjust for sorp 9 unit recycle convergence number 10 oil molecular weight 11 oil density (g/cc) 12 NaUT 1=municipal 2=industrial 3=to 13 NaUT 1=mass tr. 2=equil 14 parts biomass per 1000 parts COD 15 oil water partition method 0=owpc 16 use UNIFAC aqueous data base =1 17 specify mass transfer for unit, =1 18 Use biomass for unit option, =1 19 biogrowth Monod half concentration	otion	0 50 5 61 40 25 84 128 66 447 500 .015 .016 .006 12 25 5 2 .4
DETAILED CALCULATIONS at Unit 11 ASB 2 Type: aerated biotreatment Project C:\Users\akelley\Desktop\Wat Comments Run\ASB\ASB Oct 5 Response v2 10/4/ 22:21:39 COMPOUND: METHANETHIOL (methyl mercapta	ter9\Octol /2021 7:59	
Type of unit is aerated biotreatment 1 Description of unit 2 Wastewater temperature (C) 3 length of aeration unit (m) 4 width of aeration unit (m) 5 depth of aeration unit (m) 6 Area of agitation (each aerator, m2) 7 Total number of agitators in the uni	11 it	ASB Zone 1 35.2 225 225 1.4 135 16

```
8 Power of agitation (each aerator, HP)
                                                        49.53
      9 Impeller diameter (cm)
      10 Impeller rotation (RPM)
                                                        1200
      11 Agitator mechanical efficiency
                                                       0.83
      12 aerator effectiveness, alpha
                                                       0.83
      13 if there is plug flow, enter 1
                                                        0
      14 Overall biorate (mg/g bio-hr)
                                                        19
      15 Aeration air flow (m3/s)
                                                        Ω
      16 active biomass, aeration (g/1)
                                                        0.3
      17 If covered, then enter 1
                                                        0
      18 special input
                                                        0
      19 pH (enter 0 for no pH adjustment)
                                                        8.28
      Properties of METHANETHIOL (methyl mercaptan) at 35.2 deg.C
(95.4 deg.F)
         hl = 0.004295 \text{ atm-m3/mol} vp = 2347.095 \text{ mmHg} (45.398)
psia)
             238.61 y/x
             0.16984 g/L gas per g/L liquid
         Temperature adjustment factor = 1.046 ^(T-25), deg. C
                                 dl = 1.531e - 05 cm2/s dv = 0.23854
         k1=0. L/g-hr
cm2/s
      Compound flow rate from inlet water is 0.051199 g/s.
      Compound flow rate from inlet vent is 0. g/s.
      Compound flow rate from inlet duct is 0. g/s.
      Submerged aeration rate from inlet vent is 0. m3/s.
      Total submerged aeration is 0. m3/s.
      The residence time in the unit is 20.713 hr.
          Biomass production
          The biomass production rate is 0.mg/hr. (0. mg/L)
          The fraction dissolved solids converted is 0. .
          The estimated biomass exit concentration is 0. mg/L.
             Quiescent wind shear surface Springer
      The fetch to depth ratio is 181.347.
      kl is estimated as 7.722e-06 \text{ m/s}.
      kg is estimated as 0.011248 m/s. Model: 2
      kg is estimated as 0.011248 m/s. Model: 2
      The Schmidt number is 0.62883.
      The friction velocity is 37.398 \text{ m/s}
      kg is estimated as 0.024272 m/s. Model: 3
              Agitated surface
      The rotation speed is 125.654 radians per second.
      The rotation factor NRW is 2.052e+06.
      The power number NPR is 7.881e-04.
      The rotation factor NFR is 797.027.
      kg (agitated) is estimated as 0.19037 m/s.
      kl (agitated) is estimated as 0.021776 m/s.
          The specified and growth biomass is 0.3 g/L.
       The effective KL (surface + diffused air) is 5.742e-04
m/s.
       The effective stripping time (surface + diffused air) is
40.638 minutes. (0.67729 hrs.)
```

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The pump mixing time is 5 x the pumping recirculaion time, 0. min. The ratio of the mixing to the striping (surface + diffused air) is 0. The mean residence time is 1242.781 min. (20.713 hr.) The ratio of the pump mixing to the residence time is 0. KG aerated (m/s) 0.19394 KL aerated (m/s)0.021776 KL OVERALL AERATED (m/s) 0.013285 KG quiescent (m/s) 0.011459 KL quiescent (m/s) 7.722e-06 KL OVERALL QUIESCENT (m/s) 7.692e-06 KL OVERALL (m/s) 5.742e-04 air stripping time constant (min) 40.638
FRACTION SURFACE VOLATILIZED 0.86677
FRACTION SURFACE VOLATILIZED FRACTION SUBMERGED VOLATILIZED
TOTAL FRACTION VOLATILIZED
FRACTION BIOLOGICALLY REMOVED
FRACTION ABSORBED FRACTION SUBMERGED VOLATILIZED TOTAL FRACTION VOLATILIZED 0. 0.86677 0.10489 FRACTION ABSORBED 0. DETAILED CALCULATIONS at Unit 12 def.system exit st Type: system exit stream Project C:\Users\akelley\Desktop\Water9\October 5 Comments Run\ASB\ASB Oct 5 Response v2 10/4/2021 7:59:10 PM COMPOUND: METHANETHIOL(methyl mercaptan) Type of unit is system exit stream 1 Description of unit 12 def.system exit st TOTAL AIR EMISSIONS (g/s) 0. 0. (Mg/year) EMISSION FACTOR (q/cm2-s) 8.766e-11 UNIT EXIT CONCENTRATION (ppmw) 3.417e-06 DETAILED CALCULATIONS at Unit 13 default open hub d Type: open hub drain Project C:\Users\akelley\Desktop\Water9\October 5 Comments Run\ASB\ASB Oct 5 Response v2 10/4/2021 7:59:10 PM 22:21:39 COMPOUND: METHANETHIOL(methyl mercaptan) Type of unit is open hub drain 1 Description of unit 13 default open hub d 2 Underflow T (C) 44.4 3 Total water added at the unit (1/s) \cap 50 4 Area of openings at unit (cm2) 5 Radius of drop pipe (cm)

```
7 Open surface=1
                                                     1
     8 Subsurface entrance=1
                                                     0
     9 subsurface exit =1
                                                    0
     10 radius of underflow conduit (cm)
                                                    12
     11 distance to next unit (cm)
                                                    500
     12 slope of underflow conduit
                                                    0.015
                                                    84
     16 velocity air at drain opening (ft/min)
     17 municipal waste in conduit =1
                                                    0
     18 Assume equilibrium in unit, =1
     19 pH (enter 0 for no pH adjustment)
                                                    8.9
      Equilibrium partitioning in drain drop hub is assumed.
        Total drain flow is 950.489 1/s.
        Weight fraction down is 6.535299E-08
        Gas concentration in 0 mol fraction.
        Gas flow 950.489 L/s
        Weight fraction out at base of drop is
5.38664415102028E-08
        fraction transferred in the drain drop from hub
is .175762
        fraction loss in wastel drop to hub
                                                0.
        fraction loss in waste2 drop to hub
                                               0.
        fraction loss in waste3 drop to hub
                                               0.
        fraction loss in collection hub drop
                                               0.17576
        fraction loss in unit
                                               0.
        fraction loss in line run
                                               7.276e-08
        1.829e-19
                                              6.219e-06
                                               -9.505e+05
        headspace flow down line (cc/s)
                                            9.505e+05
        KG surface (m/s)
                                               3294.605
        KL surface (m/s)
                                               7.724e-09
        flow of waste down hub (1/s)
                                               0.
        component flow in waste into unit (g/s) 0.062117
        total component into unit, g/s
TOTAL AIR EMISSIONS (g/s)
                                               0.051199
                                               0.010918
        (Mg/year)
EMISSION FACTOR (g/cm2-s)
                                               0.34431
                                               8.766e-11
        UNIT EXIT CONCENTRATION (ppmw)
                                               0.053866
     DETAILED CALCULATIONS at Unit 17 ASB Zone 3
     Type: aerated biotreatment
       Project C:\Users\akelley\Desktop\Water9\October 5
Comments Run\ASB\ASB Oct 5 Response v2 10/4/2021 7:59:10 PM
22:21:39
     COMPOUND: METHANETHIOL (methyl mercaptan)
     Type of unit is aerated biotreatment
                                              17 ASB Zone 3
     1 Description of unit
```

6 Drop length to conduit (cm)

61

```
2 Wastewater temperature (C)
      3 length of aeration unit (m)
                                                       380.4
      4 width of aeration unit (m)
                                                       190.2
      5 depth of aeration unit (m)
                                                      0.91
      6 Area of agitation (each aerator, m2)
                                                      135
      7 Total number of agitators in the unit
      8 Power of agitation (each aerator, HP)
                                                       75
                                                       49.53
      9 Impeller diameter (cm)
      10 Impeller rotation (RPM)
                                                       1200
      11 Agitator mechanical efficiency
                                                       0.83
      12 aerator effectiveness, alpha
                                                      0.83
      13 if there is plug flow, enter 1
                                                       \Omega
      14 Overall biorate (mg/g bio-hr)
                                                       19
      15 Aeration air flow (m3/s)
                                                       0
      16 active biomass, aeration (g/1)
                                                       0.3
      17 If covered, then enter 1
                                                       0
      18 special input
      19 pH (enter 0 for no pH adjustment)
                                                       8.37
      Properties of METHANETHIOL (methyl mercaptan) at 31.2 deg.C
(88.2 \text{ deg.F})
         hl= 0.003821 atm-m3/mol vp= 2088.317 mmHg (40.392)
psia)
             212.302 y/x
             0.1531 g/L gas per g/L liquid
         Temperature adjustment factor = 1.046 ^(T-25), deg. C
                               dl = 1.511e - 05 cm2/s dv = 0.23316
         k1=0. L/q-hr
cm2/s
      Compound flow rate from inlet water is 4.733e-05 g/s.
      Compound flow rate from inlet vent is 0. g/s.
      Compound flow rate from inlet duct is 0. g/s.
      Submerged aeration rate from inlet vent is 0. m3/s.
      Total submerged aeration is 0. m3/s.
      The residence time in the unit is 19.242 hr.
         Biomass production
          The biomass production rate is 0.mg/hr. (0. mg/L)
          The fraction dissolved solids converted is 0. .
          The estimated biomass exit concentration is 0. mg/L.
              Quiescent wind shear surface Springer
      The fetch to depth ratio is 333.533.
      kl is estimated as 7.655e-06 \text{ m/s}.
      kg is estimated as 0.010862 m/s. Model: 2
      kg is estimated as 0.010862 m/s. Model: 2
      The Schmidt number is 0.64333.
      The friction velocity is 37.398 \text{ m/s}
      kg is estimated as 0.02392 m/s. Model: 3
             Agitated surface
      The rotation speed is 125.654 radians per second.
      The rotation factor NRW is 2.052e+06.
      The power number NPR is 7.881e-04.
      The rotation factor NFR is 797.027.
      kg (agitated) is estimated as 0.18821 m/s.
```

31.211

```
kl (agitated) is estimated as 0.019682 m/s.
             The specified and growth biomass is 0.3 g/L.
         The effective KL (surface + diffused air) is 1.405e-04
m/s.
         The effective stripping time (surface + diffused air) is
107.921 minutes. (1.79869 hrs.)
         The pump mixing time is 5 \times 10^{-5} x the pumping recirculation time,
0. min.
         The ratio of the mixing to the striping (surface +
diffused air) is 0.
         The mean residence time is 1154.5 min. (19.242 hr.)
         The ratio of the pump mixing to the residence time is 0.
           KG aerated (m/s)
                                                                  0.19174
            KL aerated (m/s)
                                                                  0.019682
           KL OVERALL AERATED (m/s)
KG quiescent (m/s)
KL quiescent (m/s)
                                                                  0.01188
                                                                  0.011066
                                                                  7.655e-06
           KL quiescent (m/s)
KL OVERALL QUIESCENT (m/s)
           KL QUIESCENT (m/s) 7.655e-06
KL OVERALL QUIESCENT (m/s) 7.621e-06
KL OVERALL (m/s) 1.405e-04
air stripping time constant (min) 107.921
FRACTION SURFACE VOLATILIZED 0.73417
FRACTION SUBMERGED VOLATILIZED 0.
           TOTAL FRACTION VOLATILIZED

FRACTION BIOLOGICALLY REMOVED

FRACTION ABSORBED

O.

TOTAL AIR EMISSIONS (g/s)

(Mg/year)

EMISSION FACTOR (g/cm2-s)

UNIT EXIT CONCENTRATION (ppmw)

CALCIUM ATTONS of Unit 19 ACR CATCOL
            TOTAL FRACTION VOLATILIZED
                                                                 0.73417
       DETAILED CALCULATIONS at Unit 18 ASB Zone 2
       Type: aerated biotreatment
          Project C:\Users\akelley\Desktop\Water9\October 5
Comments Run\ASB\ASB Oct 5 Response v2 10/4/2021 7:59:10 PM
22:21:39
       COMPOUND: METHANETHIOL (methyl mercaptan)
        Type of unit is aerated biotreatment
        1 Description of unit
                                                                 18
                                                                        ASB Zone 2
        2 Wastewater temperature (C)
                                                                         32.4
        3 length of aeration unit (m)
                                                                         365
        4 width of aeration unit (m)
                                                                        182.3
        5 depth of aeration unit (m)
                                                                        0.97
       6 Area of agitation (each aerator, m2)
7 Total number of agitators in the unit
8 Power of agitation (each aerator, HP)
                                                                        135
                                                                       15
                                                                        75
        9 Impeller diameter (cm)
                                                                        49.53
       10 Impeller rotation (KFF),
11 Agitator mechanical efficiency 0.83
0.83
       10 Impeller rotation (RPM)
                                                                        1200
       13 if there is plug flow, enter 1
14 Overall biorate (mg/g bio-hr)
                                                                        0
                                                                        19
```

15 Aeration air flow (m3/s)

```
0.3
      16 active biomass, aeration (g/l)
      17 If covered, then enter 1
                                                        0
      18 special input
                                                        0
             (enter 0 for no pH adjustment)
                                                        8.33
      19 pH
      Properties of METHANETHIOL (methyl mercaptan) at 32.4 deg.C
(90.3 \text{ deg.F})
         hl = 0.003958 atm - m3/mol
                                  vp= 2163.09 mmHg (41.839
psia)
             219.904 y/x
             0.15796 g/L gas per g/L liquid
         Temperature adjustment factor = 1.046 \, (T-25), deg. C
                                dl= 1.517e-05 cm2/s dv= 0.23476
         k1=0. L/q-hr
cm2/s
      Compound flow rate from inlet water is 0.001451 g/s.
      Compound flow rate from inlet vent is 0. q/s.
      Compound flow rate from inlet duct is 0. g/s.
      Submerged aeration rate from inlet vent is 0. m3/s.
      Total submerged aeration is 0. m3/s.
      The residence time in the unit is 18.863 hr.
          Biomass production
          The biomass production rate is 0.mg/hr. (0. mg/L)
          The fraction dissolved solids converted is 0. .
          The estimated biomass exit concentration is 0. mg/L.
             Quiescent wind shear surface Springer
      The fetch to depth ratio is 300.07.
      kl is estimated as 7.675e-06 \text{ m/s}.
      kg is estimated as 0.010962 m/s. Model: 2
      kg is estimated as 0.010962 m/s. Model: 2
      The Schmidt number is 0.63895.
      The friction velocity is 37.398 \text{ m/s}
      kg is estimated as 0.024025 m/s. Model: 3
             Agitated surface
      The rotation speed is 125.654 radians per second.
      The rotation factor NRW is 2.052e+06.
      The power number NPR is 7.881e-04.
      The rotation factor NFR is 797.027.
      kg (agitated) is estimated as 0.18886 m/s.
      kl (agitated) is estimated as 0.020285 m/s.
          The specified and growth biomass is 0.3 g/L.
       The effective KL (surface + diffused air) is 3.813e-04
m/s.
       The effective stripping time (surface + diffused air) is
42.403 minutes. (0.70671 hrs.)
       The pump mixing time is 5 x the pumping recirculation time,
       The ratio of the mixing to the striping (surface +
diffused air) is 0.
       The mean residence time is 1131.756 min. (18.863 hr.)
       The ratio of the pump mixing to the residence time is 0.
         KG aerated (m/s)
                                                   0.1924
         KL aerated (m/s)
                                                   0.020285
```

KL OVERALL AERATED (m/s)	0.012284
KG quiescent (m/s)	0.011168
KL quiescent (m/s)	7.675e-06
KL OVERALL QUIESCENT (m/s)	7.643e-06
KL OVERALL (m/s)	3.813e-04
air stripping time constant (min)	42.403
FRACTION SURFACE VOLATILIZED	0.87048
FRACTION SUBMERGED VOLATILIZED	0.
TOTAL FRACTION VOLATILIZED	0.87048
FRACTION BIOLOGICALLY REMOVED	0.096909
FRACTION ABSORBED	0.
TOTAL AIR EMISSIONS (q/s)	0.001263
(Mg/year)	0.039835
EMISSION FACTOR (g/cm2-s)	1.898e-12
UNIT EXIT CONCENTRATION (ppmw)	4.979e-05

IPT COMMENT 11 REVISED TRS COMPOUND FBIO CALCULATIONS POST-ASB WATER9 OUTPUT

	Type of unit is		
	Type of unit is 1 Total water added at the unit (1/s) 2 Area of openings at unit (cm2) 3 Radius of drop pipe (cm) 4 Drop length to conduit (cm) 5 Humidity of inlet air (%) 6 Temperature of air (C) 7 Drain air velocity (ft/min) 8 manhole air velocity (ft/min) 9 Conduit air velocity (ft/min) 10 Wind speed (cm/s at 10 m) 11 distance to next unit (cm) 12 slope of underflow conduit 13 friction factor liquid 14 friction factor gas 15 radius of underflow conduit (cm) 16 Underflow T (C) 17 oscillation cycle time (min) 18 design collection velocities (ft/s) 19 design branch line fraction full	50	0 50 5 61 40 25 84 128 66 447 500 .015 .016 .006 12 25 5
	Type of unit is 8 HL partition flag=1, adjust for sorption 9 unit recycle convergence number 10 oil molecular weight 11 oil density (g/cc) 12 NaUT 1=municipal 2=industrial 3=turb. 13 NaUT 1=mass tr. 2=equil 14 parts biomass per 1000 parts COD 15 oil water partition method 0=owpc 16 use UNIFAC aqueous data base =1 17 specify mass transfer for unit, =1 18 Use biomass for unit option, =1 19 biogrowth Monod half concentration ppm		0 200 0 0 0
	DETAILED CALCULATIONS at Unit 11 def.aerate Type: aerated biotreatment Project C:\Users\akelley\Desktop\Water9\Onto hts Run\Post-ASB\Post ASB Oct 5 Response v2 08 PM 22:31:17 COMPOUND: DIMETHYL DISULFIDE	October	5
def.ae	Type of unit is aerated biotreatment 1 Description of unit erated biotre 2 Wastewater temperature (C) 3 length of aeration unit (m) 4 width of aeration unit (m) 5 depth of aeration unit (m) 6 Area of agitation (each aerator, m2)		28.9 18.3 12.2 4.6 47

```
7 Total number of agitators in the unit
      8 Power of agitation (each aerator, HP)
                                                        75
      9 Impeller diameter (cm)
                                                        49.53
      10 Impeller rotation (RPM)
                                                        1200
      11 Agitator mechanical efficiency
                                                        0.83
      12 aerator effectiveness, alpha
                                                       0.83
      13 if there is plug flow, enter 1
                                                        0
      14 Overall biorate (mg/g bio-hr)
                                                        19
      15 Aeration air flow (m3/s)
                                                        0
      16 active biomass, aeration (g/l)
                                                        0.3
      17 If covered, then enter 1
                                                        0
      18 special input
      19 pH (enter 0 for no pH adjustment)
                                                        7.86
      Properties of DIMETHYL DISULFIDE at 28.9 deg.C (84. deg.F)
         hl = 0.001336 \text{ atm-m3/mol} vp = 35.818 \text{ mmHg} (0.6928)
psia)
             74.216 \text{ y/x}
             0.053929 g/L gas per g/L liquid
         Temperature adjustment factor = 1.046 ^(T-25), deg. C
                                 dl = 1.023e - 05 cm2/s dv = 0.085441
         k1=0. L/g-hr
cm2/s
      Compound flow rate from inlet water is 0.003822 g/s.
      Compound flow rate from inlet vent is 0. g/s.
      Compound flow rate from inlet duct is 0. g/s.
      Submerged aeration rate from inlet vent is 0. m3/s.
      Total submerged aeration is 0. m3/s.
      The residence time in the unit is 0.28269 hr.
          Biomass production
          The biomass production rate is 0.mg/hr. (0. mg/L)
          The fraction dissolved solids converted is 0. .
          The estimated biomass exit concentration is 0. mg/L.
             Quiescent wind shear surface Springer
      Springer correlation does not apply, use Mackay and Yeun
(1983).
      The friction velocity is 13.347cm/s.
      The Schmidt number is 977.316.
      kl is estimated as 6.485e-06 \text{ m/s}.
      kg is estimated as 0.007619 m/s. Model: 2
      kg is estimated as 0.007619 m/s. Model: 2
      The Schmidt number is 1.75559.
      The friction velocity is 31.28 m/s
      kg is estimated as 0.010777 m/s. Model: 3
              Agitated surface
      The rotation speed is 125.654 radians per second.
      The rotation factor NRW is 2.052e+06.
      The power number NPR is 7.881e-04.
      The rotation factor NFR is 797.027.
      kg (agitated) is estimated as 0.11393 m/s.
      kl (agitated) is estimated as 0.044043 m/s.
          The specified and growth biomass is 0.3 \text{ g/L}.
       The effective KL (surface + diffused air) is 0.001172 m/s.
```

```
The effective stripping time (surface + diffused air) is
65.412 minutes. (1.09019 hrs.)
        The pump mixing time is 5 x the pumping recirculaion time,
0. min.
        The ratio of the mixing to the striping (surface +
diffused air) is 0.
        The mean residence time is 16.961 min. (0.28269 hr.)
        The ratio of the pump mixing to the residence time is 0.
           KG aerated (m/s)
                                                              0.11607
           KL aerated (m/s)
                                                              0.044043
           KL OVERALL AERATED (m/s)
                                                              0.005544
           KG quiescent (m/s)
KL quiescent (m/s)
KL OVERALL QUIESCENT (m/s)
                                                             0.007762
                                                             6.485e-06
                                                             6.388e-06
           KL OVERALL (m/s)
                                                             0.001172
          KL OVERALL (m/s)
air stripping time constant (min)
65.412
FRACTION SURFACE VOLATILIZED
0.16959
FRACTION SUBMERGED VOLATILIZED
0.16959
FRACTION BIOLOGICALLY REMOVED
0.17636
           FRACTION ABSORBED
                                                             0.
          FRACTION ABSORBED

TOTAL AIR EMISSIONS (g/s)

(Mg/year)

EMISSION FACTOR (g/cm2-s)

UNIT EXIT CONCENTRATION (ppmw)

0.020439
2.903e-10
0.002477
       DETAILED CALCULATIONS at Unit 14 default open hub d
       Type: open hub drain
          Project C:\Users\akelley\Desktop\Water9\October 5
Comments Run\Post-ASB\Post ASB Oct 5 Response v2 10/4/2021
8:20:08 PM 22:31:17
       COMPOUND: DIMETHYL DISULFIDE
       Type of unit is open hub drain
                                                            14 default
       1 Description of unit
open hub d
                                                                     29.3
       2 Underflow T (C)
       3 Total water added at the unit (1/s)
4 Area of openings at unit (cm2)
                                                                    0
                                                                    50
       5 Radius of drop pipe (cm)
       6 Drop length to conduit (cm)
                                                                    61
       7 Open surface=1
                                                                     0
       8 Subsurface entrance=1
                                                                     0
       9 subsurface exit =1
                                                                    0
       10 radius of underflow conduit (cm)
11 distance to next unit (cm)
12 close of underflow conduit
                                                                    12
                                                                     500
       12 slope of underflow conduit
                                                                    0.015
       16 velocity air at drain opening (ft/min) 84
17 municipal waste in conduit =1 0
18 Assume equilibrium in unit, =1 0
       19 pH (enter 0 for no pH adjustment) 7.65
```

Equilibrium partitioning in drain drop hub is assumed.

```
Total drain flow is 1009.151 l/s.
         Weight fraction down is 3.994999E-09
         Gas concentration in 0 mol fraction.
         Gas flow 1009.151 L/s
         Weight fraction out at base of drop is
3.78699280644153E-09
         fraction transferred in the drain drop from hub
is .052067
         fraction loss in wastel drop to hub
                                                       0.
         fraction loss in waste2 drop to hub
                                                      0.
                                                     0.
         fraction loss in waste3 drop to hub
         fraction loss in collection hub drop 0.052067
         fraction loss in unit
                                                      0.
         fraction loss in line run
         component upstream of unit, g/s
         mol fract. headspace upstream (y)
headspace at conduit discharge, y
headspace end of conduit (y)

5.477e-08
         headspace end of conduit (y)
                                                      5.477e-08
         mol fract. headspace vent base headspace flow out vent (cc/s) headspace flow down line (cc/s)
                                                 5.477e-08
-1.009e+0
1.009e+06
                                                     -1.009e+06
         KG surface (m/s)
                                                      1686.846
         flow of waste down hub (1/s) component flow in waste
                                                    5.947e-09
                                                     0.
         component flow in waste into unit (g/s) 0.004032
         total component into unit, g/s 0.003822
TOTAL AIR EMISSIONS (g/s) 2.099e-04
(Mg/year) 0.00662
                                                      2.099e-04
         EMISSION FACTOR (g/cm2-s)
                                                      2.903e-10
         UNIT EXIT CONCENTRATION (ppmw)
                                                      0.003787
      DETAILED CALCULATIONS at Unit 15 def.diffused air b
      Type: diffused air biotreatment
        Project C:\Users\akelley\Desktop\Water9\October 5
Comments Run\Post-ASB\Post ASB Oct 5 Response v2 10/4/2021
8:20:08 PM 22:31:17
      COMPOUND: DIMETHYL DISULFIDE
      Type of unit is diffused air biotreatment
      1 Description of unit
                                                     15
def.diffused air b
                                                            28.9
      2 Wastewater temperature (C)
      3 length of aeration unit (m)
                                                           17.9
      4 width of aeration unit (m)
                                                           9.9
      5 depth of aeration unit (m)
                                                           4.6
      6 fraction of surface agitated by air
                                                            1
      7 fraction of surface quiescent
                                                            0
      13 if there is plug flow, enter 1
      14 Overall biorate (mg/g bio-hr)
                                                           19
      15 Aeration air flow (m3/s)
                                                            0
      16 activated sludge biomass(q/l)
                                                            2
                                                            0
      17 If covered, then enter 1
      18 special input
```

```
19 pH (enter 0 for no pH adjustment)
                                                        7.86
      Properties of DIMETHYL DISULFIDE at 28.9 deg.C (84. deg.F)
         hl = 0.001336 \text{ atm-m3/mol} vp = 35.818 \text{ mmHg} (0.6928)
psia)
             74.216 \text{ y/x}
             0.053929 g/L gas per g/L liquid
         Temperature adjustment factor = 1.046 ^(T-25), deg. C
                                 dl= 1.023e-05 cm2/s dv= 0.085441
         k1=0. L/g-hr
cm2/s
      Compound flow rate from inlet water is 0.0025 g/s.
      Compound flow rate from inlet vent is 0. g/s.
      Compound flow rate from inlet duct is 0. g/s.
      Submerged aeration rate from inlet vent is 0. m3/s.
      Total submerged aeration is 0. m3/s.
      The residence time in the unit is 0.22438 hr.
          Biomass production
          The biomass production rate is 0.mg/hr. (0. mg/L)
          The fraction dissolved solids converted is 0. .
          The estimated biomass exit concentration is 0. mg/L.
              Quiescent wind shear surface___Springer_
      Springer correlation does not apply, use Mackay and Yeun
(1983).
      The friction velocity is 13.347cm/s.
      The Schmidt number is 977.316.
      kl is estimated as 6.485e-06 m/s.
      kg is estimated as 0.007716 m/s. Model: 2
      kg is estimated as 0.007716 m/s. Model: 2
      The Schmidt number is 1.75559.
      The friction velocity is 28.484 \text{ m/s}
      kg is estimated as 0.009902 m/s. Model: 3
              Agitated surface
      The rotation speed is 125.654 radians per second.
      The rotation factor NRW is 3.011e+06.
      The power number NPR is 6.188e-05.
      The rotation factor NFR is 965.508.
      kg (agitated) is estimated as 0.056285 m/s.
      kl (agitated) is estimated as 0.016945 m/s.
          The specified and growth biomass is 2. g/L.
       The effective KL (surface + diffused air) is 0.002644 m/s.
       The effective stripping time (surface + diffused air) is
28.996 minutes. (0.48326 hrs.)
       The pump mixing time is 5 \times 10^{-5} x the pumping recirculation time,
0. min.
       The ratio of the mixing to the striping (surface +
diffused air) is 0.
       The mean residence time is 13.463 min. (0.22438 hr.)
       The ratio of the pump mixing to the residence time is 0.
         KG aerated (m/s)
                                                    0.05734
         KL aerated (m/s)
                                                   0.016945
         KL OVERALL AERATED (m/s)
                                                   0.002644
         KG quiescent (m/s)
                                                   0.007861
```

KL quiescent (m/s)	6.485	=-06
-	6.3896	e-06
KL OVERALL (m/s)	0.0026	644
air stripping time constant (min)	28.996	5
	0.1605	57
FRACTION SUBMERGED VOLATILIZED	0.	
TOTAL FRACTION VOLATILIZED	0.1605	
FRACTION BIOLOGICALLY REMOVED	0.4936	5
FRACTION ABSORBED	0.	
(13.)	4.0146	
· 3· 4	0.0126	
, <u>, , , , , , , , , , , , , , , , , , </u>	2.265	
UNIT EXIT CONCENTRATION (ppmw)		
DETAILED CALCULATIONS at Unit 17 def.system Type: system exit stream	i exit s	5 L
Project C:\Users\akelley\Desktop\Water9\C)ctober	5
Comments Run\Post-ASB\Post ASB Oct 5 Response v2		
8:20:08 PM 22:31:17	10, 1, 1	
COMPOUND: DIMETHYL DISULFIDE		
Type of unit is system exit stream		
1 Description of unit	17	def.system
exit st		
TOTAL AIR EMISSIONS (g/s)	0.	
(Mg/year)	0.	1.0
EMISSION FACTOR (g/cm2-s)	2.265	-
UNIT EXIT CONCENTRATION (ppmw)	8.5666	9-04

Type of unit is				
Type of unit is 1 Total water adde 2 Area of openings 3 Radius of drop p 4 Drop length to o 5 Humidity of inle 6 Temperature of a 7 Drain air veloc: 8 manhole air veloc 9 Conduit air veloc 10 Wind speed (cm, 11 distance to nes 12 slope of unders 13 friction factor 14 friction factor 15 radius of under 16 Underflow T (C) 17 oscillation cyc 18 design collects 19 design branch	s at unit (cm2) pipe (cm) conduit (cm) et air (%) air (C) ity (ft/min) pocity (ft/min) /s at 10 m) kt unit (cm) flow conduit c liquid c gas cflow conduit (cr) cle time (min) ion velocities	n) (ft/s)	50	0 50 5 61 40 25 84 128 66 447 500 015 .016 .006 12 25 5
Type of unit is 8 HL partition fla 9 unit recycle cor 10 oil molecular of 11 oil density (color to the color	nvergence number weight g/cc) al 2=industrial 2=equil per 1000 parts Contion method 0=ox data base = fansfer for unit grunit option, = fansfer fan fansfer fansfer fan fansfer fan fansfer fan fansfer fan	3=turb. DD wpc 1 , =1		0 200 0 0 0
DETAILED CALCULAT: Type: aerated biod Project C:\Users Comments Run\Post-ASB\Po 8:20:08 PM 22:31:38 COMPOUND: DIMETHY	treatment s\akelley\Desktop ost ASB Oct 5 Re	<mark>p\Water9\(</mark> sponse v2	October	5
Type of unit is as 1 Description of a def.aerated biotre 2 Wastewater temps 3 length of aeratic 4 width of aeratic 5 depth of aeratic 6 Area of agitatic	erature (C) ion unit (m) on unit (m) on unit (m)		- - - -	28.9 18.3 12.2 4.6 47

```
7 Total number of agitators in the unit
                                                       75
      8 Power of agitation (each aerator, HP)
      9 Impeller diameter (cm)
                                                       49.53
      10 Impeller rotation (RPM)
                                                       1200
      11 Agitator mechanical efficiency
                                                       0.83
      12 aerator effectiveness, alpha
                                                       0.83
      13 if there is plug flow, enter 1
                                                       0
      14 Overall biorate (mg/g bio-hr)
                                                        19
      15 Aeration air flow (m3/s)
                                                        0
      16 active biomass, aeration (g/l)
                                                        0.3
      17 If covered, then enter 1
                                                        0
      18 special input
      19 pH
            (enter 0 for no pH adjustment)
                                                        7.86
      Properties of DIMETHYL SULFIDE (DMS) at 28.9 deg.C (84.
deg.F)
        hl = 0.002417 atm - m3/mol
                                  vp= 582.329 mmHg (11.263
psia)
             134.26 \text{ v/x}
             0.097561 g/L gas per g/L liquid
         Temperature adjustment factor = 1.046 \, (T-25), deg. C
                                dl= 1.479e-05 cm2/s dv= 0.14332
         k1=0. L/q-hr
cm2/s
      Compound flow rate from inlet water is 0.001475 g/s.
      Compound flow rate from inlet vent is 0. g/s.
      Compound flow rate from inlet duct is 0. g/s.
      Submerged aeration rate from inlet vent is 0. m3/s.
      Total submerged aeration is 0. m3/s.
      The residence time in the unit is 0.28269 hr.
          Biomass production
          The biomass production rate is 0.mg/hr. (0. mg/L)
          The fraction dissolved solids converted is 0. .
          The estimated biomass exit concentration is 0. mg/L.
             Quiescent wind shear surface Springer
      Springer correlation does not apply, use Mackay and Yeun
(1983).
      The friction velocity is 13.347cm/s.
      The Schmidt number is 676.088.
      kl is estimated as 7.595e-06 \text{ m/s}.
      kg is estimated as 0.010775 m/s. Model: 2
      kg is estimated as 0.010775 m/s. Model: 2
      The Schmidt number is 1.04659.
      The friction velocity is 31.28 m/s
      kg is estimated as 0.014832 m/s. Model: 3
              Agitated surface
      The rotation speed is 125.654 radians per second.
      The rotation factor NRW is 2.052e+06.
      The power number NPR is 7.881e-04.
      The rotation factor NFR is 797.027.
      kg (agitated) is estimated as 0.14756 m/s.
      kl (agitated) is estimated as 0.052954 m/s.
          The specified and growth biomass is 0.3 \text{ g/L}.
```

```
The effective KL (surface + diffused air) is 0.002449 m/s.
                   The effective stripping time (surface + diffused air) is
31.31 minutes. (0.52184 hrs.)
                   The pump mixing time is 5 \times 10^{-5} x the pumping recirculation time,
                   The ratio of the mixing to the striping (surface +
diffused air) is 0.
                   The mean residence time is 16.961 min. (0.28269 hr.)
                   The ratio of the pump mixing to the residence time is 0.
                        KG aerated (m/s)
                                                                                                                                           0.15033
                                                                                                                                           0.052954
                        KL aerated (m/s)
                        KL OVERALL AERATED (m/s)
                                                                                                                                          0.011603
                        KG quiescent (m/s)
                                                                                                                                      0.010977
7.595e-06
7.542e-06
                       KL quiescent (m/s)

KL QUIESCENT (m/s)

KL OVERALL QUIESCENT (m/s)

KL OVERALL (m/s)

air stripping time constant (min)

FRACTION SURFACE VOLATILIZED

TOTAL FRACTION VOLATILIZED

TOTAL FRACTION VOLATILIZED

TOTAL FRACTION BIOLOGICALLY REMOVED

DACTION ARSORRED

7.595e-06

7.596e-06

7.
                        FRACTION ABSORBED
                                                                                                                                        0.
                       TOTAL AIR EMISSIONS (g/s) 4.986e-04

(Mg/year) 0.015724

EMISSION FACTOR (g/cm2-s) 2.233e-10

UNIT EXIT CONCENTRATION (ppmw) 9.12e-04
                DETAILED CALCULATIONS at Unit 14 default open hub d
                Type: open hub drain
                      Project C:\Users\akelley\Desktop\Water9\October 5
Comments Run\Post-ASB\Post ASB Oct 5 Response v2 10/4/2021
8:20:08 PM 22:31:38
                COMPOUND: DIMETHYL SULFIDE (DMS)
                Type of unit is open hub drain
                                                                                                                                   14 default
                1 Description of unit
open hub d
                2 Underflow T (C)
                                                                                                                                                        29.3
                3 Total water added at the unit (1/s)
                4 Area of openings at unit (cm2)
                                                                                                                                                       50
                5 Radius of drop pipe (cm)
                                                                                                                                                         5
                5 Radius of drop pipe (cm)
6 Drop length to conduit (cm)
                                                                                                                                                       61
                7 Open surface=1
                                                                                                                                                       0
                8 Subsurface entrance=1
                                                                                                                                                       \Omega
               9 subsurface exit =1
10 radius of underflow conduit (cm)
11 distance to next unit (cm)
12 slope of underflow conduit
16 velocity air at drain opening (ft/min)
17 resistant waste in conduit =1
18 0
                                                                                                                                                       500
                                                                                                                                                      0.015
                17 municipal waste in conduit =1 0
18 Assume equilibrium in unit, =1 0
19 pH (enter 0 for no pH adjustment) 7.65
```

```
Equilibrium partitioning in drain drop hub is assumed.
         Total drain flow is 1009.151 l/s.
         Weight fraction down is 1.606E-09
         Gas concentration in 0 mol fraction.
         Gas flow 1009.151 L/s
         Weight fraction out at base of drop is
1.46145163148041E-09
         fraction transferred in the drain drop from hub
is .090005
         fraction loss in wastel drop to hub
                                                   0.
         fraction loss in waste2 drop to hub
                                                  0.
         fraction loss in waste3 drop to hub
                                                  0.
         fraction loss in collection hub drop
                                                 0.090005
         fraction loss in unit
                                                  0.
         fraction loss in line run
                                                  0.
         component upstream of unit, g/s
                                                  0.
         mol fract. headspace upstream (y)
                                                  0.
         headspace at conduit discharge, y 5.772e-08
         headspace end of conduit (y)
                                                  5.772e-08
                                              5.771e-08
-1.009e+0
1.009e+06
         mol fract. headspace vent base
                                                 5.771e-08
         headspace flow out vent (cc/s) headspace flow down line (cc/s)
                                                  -1.009e+06
         KG surface (m/s)
                                                  2381.856
                                                  7.697e-09
         KL surface (m/s)
         flow of waste down hub (1/s)
                                                  0.
         component flow in waste into unit (g/s) 0.001621
         total component into unit, g/s
                                                  0.001475
         TOTAL AIR EMISSIONS (g/s)
                                                  1.459e-04
                          (Mg/year)
                                                  0.0046
         EMISSION FACTOR (g/cm2-s)
                                                  2.233e-10
         UNIT EXIT CONCENTRATION (ppmw)
                                                  0.001461
      DETAILED CALCULATIONS at Unit 15 def.diffused air b
      Type: diffused air biotreatment
        Project C:\Users\akelley\Desktop\Water9\October 5
Comments Run\Post-ASB\Post ASB Oct 5 Response v2 10/4/2021
8:20:08 PM 22:31:38
      COMPOUND: DIMETHYL SULFIDE (DMS)
      Type of unit is diffused air biotreatment
      1 Description of unit
                                                 15
def.diffused air b
                                                        28.9
      2 Wastewater temperature (C)
      3 length of aeration unit (m)
                                                       17.9
      4 width of aeration unit (m)
                                                       9.9
      5 depth of aeration unit (m)
                                                       4.6
      6 fraction of surface agitated by air
                                                       1
      7 fraction of surface quiescent
      13 if there is plug flow, enter 1
                                                       0
      14 Overall biorate (mg/g bio-hr)
                                                       19
      15 Aeration air flow (m3/s)
                                                       0
                                                       2
      16 activated sludge biomass(g/l)
      17 If covered, then enter 1
```

```
18 special input
      19 pH (enter 0 for no pH adjustment)
                                                        7.86
      Properties of DIMETHYL SULFIDE (DMS) at 28.9 deg.C (84.
deq.F)
         hl = 0.002417 \text{ atm-m3/mol}
                                  vp = 582.329 \text{ mmHg} (11.263)
psia)
             134.26 y/x
             0.097561 g/L gas per g/L liquid
         Temperature adjustment factor = 1.046 \, (T-25), deq. C
                                dl= 1.479e-05 cm2/s dv= 0.14332
         k1=0. L/q-hr
cm2/s
      Compound flow rate from inlet water is 9.204e-04 g/s.
      Compound flow rate from inlet vent is 0. q/s.
      Compound flow rate from inlet duct is 0. g/s.
      Submerged aeration rate from inlet vent is 0. m3/s.
      Total submerged aeration is 0. m3/s.
      The residence time in the unit is 0.22438 hr.
          Biomass production
          The biomass production rate is 0.mg/hr. (0. mg/L)
          The fraction dissolved solids converted is 0. .
          The estimated biomass exit concentration is 0. mg/L.
             Quiescent wind shear surface Springer
      Springer correlation does not apply, use Mackay and Yeun
(1983).
      The friction velocity is 13.347cm/s.
      The Schmidt number is 676.088.
      kl is estimated as 7.595e-06 \text{ m/s}.
      kg is estimated as 0.010912 m/s. Model: 2
      kg is estimated as 0.010912 m/s. Model: 2
      The Schmidt number is 1.04659.
      The friction velocity is 28.484 m/s
      kg is estimated as 0.013594 m/s. Model: 3
             Agitated surface
      The rotation speed is 125.654 radians per second.
      The rotation factor NRW is 3.011e+06.
      The power number NPR is 6.188e-05.
      The rotation factor NFR is 965.508.
      kg (agitated) is estimated as 0.072898 m/s.
      kl (agitated) is estimated as 0.020373 m/s.
          The specified and growth biomass is 2. g/L.
       The effective KL (surface + diffused air) is 0.005396 m/s.
       The effective stripping time (surface + diffused air) is
14.208 minutes. (0.23679 hrs.)
       The pump mixing time is 5 x the pumping recirculation time,
0. min.
       The ratio of the mixing to the striping (surface +
diffused air) is 0.
       The mean residence time is 13.463 min. (0.22438 hr.)
       The ratio of the pump mixing to the residence time is 0.
         KG aerated (m/s)
                                                   0.074264
         KL aerated (m/s)
                                                   0.020373
```

```
      KL OVERALL AERATED (m/s)
      0.005396

      KG quiescent (m/s)
      0.011117

      KL quiescent (m/s)
      7.595e-06

      KL OVERALL QUIESCENT (m/s)
      7.543e-06

                                                                                   7.595e-06
7.543e-06
               KL OVERALL (m/s)
                                                                                    0.005396
              KL OVERALL (m/s)
air stripping time constant (min)
FRACTION SURFACE VOLATILIZED
FRACTION SUBMERGED VOLATILIZED
TOTAL FRACTION VOLATILIZED
FRACTION BIOLOGICALLY REMOVED

O. 141769
O. 14151
               FRACTION ABSORBED
                                                                                    0.
              TOTAL AIR EMISSIONS (g/s)

(Mg/year)

EMISSION FACTOR (g/cm2-s)

UNIT EXIT CONCENTRATION (ppmw)

4.02e-04
          DETAILED CALCULATIONS at Unit 17 def.system exit st
          Type: system exit stream
            Project C:\Users\akelley\Desktop\Water9\October 5
Comments Run\Post-ASB\Post ASB Oct 5 Response v2 10/4/2021
8:20:08 PM 22:31:38
          COMPOUND: DIMETHYL SULFIDE (DMS)
          Type of unit is system exit stream
                                                                                  17 def.system
          1 Description of unit
exit st
              TOTAL AIR EMISSIONS (g/s) 0. (Mg/year) 0. EMISSION FACTOR (g/cm2-s) 2.169e-10 UNIT EXIT CONCENTRATION (ppmw) 4.02e-04
```

Type of unit is 1 Total water added at the unit (1/s) 2 Area of openings at unit (cm2) 3 Radius of drop pipe (cm) 4 Drop length to conduit (cm) 5 Humidity of inlet air (%) 6 Temperature of air (C) 7 Drain air velocity (ft/min) 8 manhole air velocity (ft/min) 9 Conduit air velocity (ft/min) 10 Wind speed (cm/s at 10 m) 11 distance to next unit (cm) 12 slope of underflow conduit 13 friction factor liquid 14 friction factor gas 15 radius of underflow conduit (cm) 16 Underflow T (C) 17 oscillation cycle time (min) 18 design collection velocities (ft/s) 19 design branch line fraction full	50	0 50 5 61 40 25 84 128 66 447 500 .015 .016 .006 12 25 5 2
Type of unit is 8 HL partition flag=1, adjust for sorption 9 unit recycle convergence number 10 oil molecular weight 11 oil density (g/cc) 12 NaUT 1=municipal 2=industrial 3=turb. 13 NaUT 1=mass tr. 2=equil 14 parts biomass per 1000 parts COD 15 oil water partition method 0=owpc 16 use UNIFAC aqueous data base =1 17 specify mass transfer for unit, =1 18 Use biomass for unit option, =1 19 biogrowth Monod half concentration ppm		0 200 0 0 0
DETAILED CALCULATIONS at Unit 11 def.aerate Type: aerated biotreatment Project C:\Users\akelley\Desktop\Water9\COMMents Run\Post-ASB\Post ASB Oct 5 Response v2 8:20:08 PM 22:32:11 COMPOUND: METHANETHIOL(methyl mercaptan)	October	5
Type of unit is aerated biotreatment 1 Description of unit def.aerated biotre 2 Wastewater temperature (C) 3 length of aeration unit (m) 4 width of aeration unit (m) 5 depth of aeration unit (m) 6 Area of agitation (each aerator, m2)		28.9 18.3 12.2 4.6 47

```
7 Total number of agitators in the unit
      8 Power of agitation (each aerator, HP)
                                                        75
      9 Impeller diameter (cm)
                                                        49.53
      10 Impeller rotation (RPM)
                                                        1200
      11 Agitator mechanical efficiency
                                                       0.83
      12 aerator effectiveness, alpha
                                                       0.83
      13 if there is plug flow, enter 1
                                                        0
      14 Overall biorate (mg/g bio-hr)
                                                        19
      15 Aeration air flow (m3/s)
                                                        0
      16 active biomass, aeration (g/1)
                                                        0.3
      17 If covered, then enter 1
                                                        0
      18 special input
      19 pH (enter 0 for no pH adjustment)
                                                        7.86
      Properties of METHANETHIOL (methyl mercaptan) at 28.9 deg.C
(84. deg.F)
         hl = 0.003566 \text{ atm-m3/mol} vp = 1948.555 \text{ mmHg} (37.689)
psia)
             198.094 v/x
             0.14395 g/L gas per g/L liquid
         Temperature adjustment factor = 1.046 \, (T-25), deg. C
         k1=0. L/q-hr
                                dl = 1.499e - 05 cm2/s dv = 0.23007
cm2/s
      Compound flow rate from inlet water is 4.422e-04 g/s.
      Compound flow rate from inlet vent is 0. g/s.
      Compound flow rate from inlet duct is 0. g/s.
      Submerged aeration rate from inlet vent is 0. m3/s.
      Total submerged aeration is 0. m3/s.
      The residence time in the unit is 0.28269 hr.
          Biomass production
          The biomass production rate is 0.mg/hr. (0. mg/L)
          The fraction dissolved solids converted is 0. .
          The estimated biomass exit concentration is 0. mg/L.
             Quiescent wind shear surface Springer
      Springer correlation does not apply, use Mackay and Yeun
(1983).
      The friction velocity is 13.347cm/s.
      The Schmidt number is 666.952.
      kl is estimated as 7.64e-06 \text{ m/s}.
      kg is estimated as 0.014795 m/s. Model: 2
      kg is estimated as 0.014795 m/s. Model: 2
      The Schmidt number is 0.65197.
      The friction velocity is 31.28 m/s
      kg is estimated as 0.019997 m/s. Model: 3
              Agitated surface
      The rotation speed is 125.654 radians per second.
      The rotation factor NRW is 2.052e+06.
      The power number NPR is 7.881e-04.
      The rotation factor NFR is 797.027.
      kg (agitated) is estimated as 0.18696 m/s.
      kl (agitated) is estimated as 0.053315 m/s.
          The specified and growth biomass is 0.3 \text{ g/L}.
```

```
The effective KL (surface + diffused air) is 0.003851 m/s.
                  The effective stripping time (surface + diffused air) is
19.911 minutes. (0.33184 hrs.)
                  The pump mixing time is 5 \times 10^{-5} x the pumping recirculation time,
                   The ratio of the mixing to the striping (surface +
diffused air) is 0.
                   The mean residence time is 16.961 min. (0.28269 hr.)
                   The ratio of the pump mixing to the residence time is 0.
                        KG aerated (m/s)
                                                                                                                                        0.19047
                       KL aerated (m/s)
                                                                                                                                        0.053315
                       KL OVERALL AERATED (m/s)
                                                                                                                                       0.018262
                       KG quiescent (m/s)
                                                                                                                                    0.015073
                       KL quiescent (m/s)

KL QUIESCENT (m/s)

KL OVERALL QUIESCENT (m/s)

Air stripping time constant (min)

FRACTION SURFACE VOLATILIZED

TOTAL FRACTION VOLATILIZED

TOTAL FRACTION VOLATILIZED

FRACTION BIOLOGICALLY REMOVED

DACTION ARSORED

7.64e-06

7.614e-06

7.614e-06

7.614e-06

7.64e-06

7.64e-06

7.614e-06

7.614e-06
                                                                                                                                    7.614e-06
                                                                                                                                     0.
                        FRACTION ABSORBED
                       TOTAL AIR EMISSIONS (g/s) 1.993e-04

(Mg/year) 0.006286

EMISSION FACTOR (g/cm2-s) 8.929e-11

UNIT EXIT CONCENTRATION (ppmw) 2.319e-04
                DETAILED CALCULATIONS at Unit 14 default open hub d
                Type: open hub drain
                     Project C:\Users\akelley\Desktop\Water9\October 5
Comments Run\Post-ASB\Post ASB Oct 5 Response v2 10/4/2021
8:20:08 PM 22:32:11
               COMPOUND: METHANETHIOL(methyl mercaptan)
               Type of unit is open hub drain
                                                                                                                                14
                1 Description of unit
                                                                                                                                                  default
open hub d
                2 Underflow T (C)
                                                                                                                                                     29.3
               3 Total water added at the unit (1/s)
               4 Area of openings at unit (cm2)
                                                                                                                                                    50
                5 Radius of drop pipe (cm)
                                                                                                                                                      5
               6 Drop length to conduit (cm)
                                                                                                                                                    61
                7 Open surface=1
                                                                                                                                                    0
               8 Subsurface entrance=1
                                                                                                                                                    \Omega
              9 subsurface exit =1
10 radius of underflow conduit (cm)
11 distance to next unit (cm)
12 slope of underflow conduit
16 velocity air at drain opening (ft/min)
17 resignal waste in conduit =1
18
                                                                                                                                                    500
                                                                                                                                                   0.015
               17 municipal waste in conduit =1 0
18 Assume equilibrium in unit, =1 0
19 pH (enter 0 for no pH adjustment) 7.65
```

```
Equilibrium partitioning in drain drop hub is assumed.
         Total drain flow is 1009.151 l/s.
         Weight fraction down is 5.02E-10
         Gas concentration in 0 mol fraction.
         Gas flow 1009.151 L/s
         Weight fraction out at base of drop is
4.38233328871256E-10
         fraction transferred in the drain drop from hub
is .127025
         fraction loss in wastel drop to hub
                                                   0.
         fraction loss in waste2 drop to hub
                                                   0.
         fraction loss in waste3 drop to hub
                                                   0.
         fraction loss in collection hub drop
                                                  0.12703
         fraction loss in unit
         fraction loss in line run
                                                  6.581e-08
         component upstream of unit, g/s
                                                   0.
         mol fract. headspace upstream (y) headspace at conduit discharge, y
                                                  0.
                                                 3.288e-08
         headspace end of conduit (y)
                                                  3.288e-08
         mol fract. headspace vent base
                                                  3.288e-08
         headspace flow out vent (cc/s) headspace flow down line (cc/s)
                                                   -1.009e+06
                                                  1.009e+06
         KG surface (m/s)
                                                  3266.015
                                                  7.771e-09
         KL surface (m/s)
         flow of waste down hub (1/s)
                                                  0.
         component flow in waste into unit (g/s) 5.066e-04
         total component into unit, g/s
                                                  4.422e-04
         TOTAL AIR EMISSIONS (g/s)
                                                  6.435e-05
                           (Mg/year)
                                                  0.002029
         EMISSION FACTOR (g/cm2-s)
                                                  8.929e-11
                                         4.3<u>82e-</u>04
         UNIT EXIT CONCENTRATION (ppmw)
      DETAILED CALCULATIONS at Unit 15 def.diffused air b
      Type: diffused air biotreatment
        Project C:\Users\akelley\Desktop\Water9\October 5
Comments Run\Post-ASB\Post ASB Oct 5 Response v2 10/4/2021
8:20:08 PM 22:32:11
      COMPOUND: METHANETHIOL (methyl mercaptan)
      Type of unit is diffused air biotreatment
      1 Description of unit
                                                  15
def.diffused air b
                                                        28.9
      2 Wastewater temperature (C)
      3 length of aeration unit (m)
                                                        17.9
      4 width of aeration unit (m)
                                                        9.9
      5 depth of aeration unit (m)
                                                        4.6
      6 fraction of surface agitated by air
                                                       1
      7 fraction of surface quiescent
      13 if there is plug flow, enter 1
                                                       0
      14 Overall biorate (mg/g bio-hr)
                                                        19
      15 Aeration air flow (m3/s)
                                                        0
                                                        2
      16 activated sludge biomass(q/l)
      17 If covered, then enter 1
```

```
18 special input
      19 pH (enter 0 for no pH adjustment)
                                                        7.86
      Properties of METHANETHIOL (methyl mercaptan) at 28.9 deg.C
(84. deg.F)
         hl = 0.003566 \text{ atm-m3/mol}
                                     vp = 1948.555 \text{ mmHg} (37.689)
psia)
             198.094 y/x
             0.14395 g/L gas per g/L liquid
         Temperature adjustment factor = 1.046 \, (T-25), deq. C
                                dl= 1.499e-05 cm2/s dv= 0.23007
         k1=0. L/q-hr
cm2/s
      Compound flow rate from inlet water is 2.34e-04 g/s.
      Compound flow rate from inlet vent is 0. q/s.
      Compound flow rate from inlet duct is 0. g/s.
      Submerged aeration rate from inlet vent is 0. m3/s.
      Total submerged aeration is 0. m3/s.
      The residence time in the unit is 0.22438 hr.
          Biomass production
          The biomass production rate is 0.mg/hr. (0. mg/L)
          The fraction dissolved solids converted is 0. .
          The estimated biomass exit concentration is 0. mg/L.
             Quiescent wind shear surface Springer
      Springer correlation does not apply, use Mackay and Yeun
(1983).
      The friction velocity is 13.347cm/s.
      The Schmidt number is 666.952.
      kl is estimated as 7.64e-06 \text{ m/s}.
      kg is estimated as 0.014984 m/s. Model: 2
      kg is estimated as 0.014984 m/s. Model: 2
      The Schmidt number is 0.65197.
      The friction velocity is 28.484 m/s
      kg is estimated as 0.018298 m/s. Model: 3
             Agitated surface
      The rotation speed is 125.654 radians per second.
      The rotation factor NRW is 3.011e+06.
      The power number NPR is 6.188e-05.
      The rotation factor NFR is 965.508.
      kg (agitated) is estimated as 0.092361 m/s.
      kl (agitated) is estimated as 0.020512 m/s.
          The specified and growth biomass is 2. g/L.
       The effective KL (surface + diffused air) is 0.008222 m/s.
       The effective stripping time (surface + diffused air) is
9.325 minutes. (0.15541 hrs.)
       The pump mixing time is 5 x the pumping recirculation time,
0. min.
       The ratio of the mixing to the striping (surface +
diffused air) is 0.
       The mean residence time is 13.463 min. (0.22438 hr.)
       The ratio of the pump mixing to the residence time is 0.
         KG aerated (m/s)
                                                   0.094092
         KL aerated (m/s)
                                                   0.020512
```